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Configuring IP Utilities

NORTEL NETWORKS™

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Contents

Preface

Before You Begin xvii
Text Conventions xviii
Acronyms xix
Hard-Copy Technical Manuals xxi
How to Get Help xxi

Chapter 1
Starting IP Utilities

Starting Configuration Tools 1-2
Configuring IP for Global Protocols 1-2
Using the BCC 1-2
Step 1: Configuring a Physical Interface 1-2
Step 2: Configuring an IP Interface 1-3
Using Site Manager 1-3
Starting TCP Services 1-4
Starting FTP Services 1-5
Starting TFTP Services 1-6
Starting Telnet Services 1-8
Starting NTP Services 1-10
Starting NetBIOS over IP 1-11
Starting the DNS Client 1-12
Starting the DNS Proxy Server 1-15

Chapter 2
Overview of IP Utilities

TCP Overview 2-1
How TCP Works 2-2
TCP Features 2-3
Connection Types 2-4

Connections and Connection States 2-4
TCP Memory Considerations 2-5
TCP and IP Service Users 2-6
FTP Overview 2-7
How FTP Works 2-8
TFTP Overview 2-10
Telnet Overview 2-11
Telnet Server 2-12
Telnet Client 2-13
NTP Overview 2-15
NTP Terminology 2-15
NTP System Implementation Model 2-15
How NTP Distributes Time Within the Subnet 2-17
Synchronizing with the Best Available Time Server 2-17
NTP Modes of Operation 2-18
Unicast Client Mode 2-18
Broadcast and Multicast Client Mode 2-19
NetBIOS Overview 2-20
NetBIOS in an IP Environment 2-21
Forwarding Name Queries over an Unnumbered Interface 2-24
DNS Overview 2-24
DNS Proxy Server 2-24
How the DNS Proxy Server Works 2-25
How the DNS Cache Works 2-26

Chapter 3
Customizing TCP Services

Disabling and Reenabling TCP 3-2
Setting the Minimum Retransmission Timeout 3-3
Setting the Maximum Retransmission Timeout 3-4
Setting the Maximum Window Size 3-6

Chapter 4
Customizing FTP Services

Configuring FTP Using the BCC or Site Manager 4-2
Disabling and Reenabling FTP 4-2

Specifying the FTP Default Volume 4-3
Specifying the Number of Login Retries 4-5
Specifying the Maximum FTP Idle Timeout 4-6
Specifying the Maximum Number of FTP Sessions 4-7
Specifying the Data Transmission Type 4-8
Specifying the FTP Control Connection 4-8
Specifying a Data Transfer Value 4-9
Specifying the TCP Window Size 4-10

Chapter 5
Customizing TFTP Services

Disabling and Reenabling TFTP Services 5-2
Specifying the Default Volume for the Router 5-3
Specifying a Retry Timeout Value 5-4
Specifying a Close Timeout Value 5-5
Specifying the Number of Retransmissions 5-6
Deleting TFTP from the Router 5-7

Chapter 6
Customizing Telnet Services

Configuring Telnet Using the BCC or Site Manager 6-2
Customizing the Telnet Configuration 6-3
Changing the Name of the Manager's Login Script File 6-3
Changing the Name of the User's Login Script File 6-4
Enabling and Disabling User Logout 6-5
Customizing the Telnet Server on the Router 6-6
Disabling and Reenabling a Telnet Server on the IP Router 6-6
Specifying the Maximum Number of Lines on the Console 6-8
Pausing Telnet Console Output 6-9
Changing the Telnet Login Prompt 6-10
Changing the Login Timeout 6-11
Changing the Password Timeout 6-12
Changing the Command Timeout 6-13
Changing Login Retries 6-14
Using Telnet Server Diagnostics 6-15
Enabling Diagnostic Reporting 6-15

Enabling Diagnostic Exercise 6-16
Enabling Diagnostic Network Data 6-17
Enabling Diagnostic PTY Data 6-18
Enabling Diagnostic Options 6-18
Changing the History File 6-19
Customizing a Telnet Client on the Router 6-20
Disabling and Reenabling a Telnet Client on the IP Router 6-20
Enabling and Disabling Verbose Debug Logging 6-21
Changing the Remote Port 6-22
Changing the Command Prompt 6-23

Chapter 7
Customizing NTP Services

Configuring NTP Using the BCC or Site Manager 7-2
Disabling and Reenabling NTP 7-2
Setting the NTP Operation Mode 7-3
Configuring Remote Time Servers 7-5
Adding Remote Time Servers 7-5
Setting the Mode for a Remote Time Server 7-7
Setting Local Host Mode 7-8
Specifying the Source IP Address 7-9
Specifying Peer Preference 7-10
Deleting Remote Time Servers from a Router 7-12
Configuring NTP Access Control 7-13
Specifying the IP Address of the Time Server 7-13
Specifying a Filter Type and IP Subnet Mask 7-14
Deleting Access for a Time Server 7-15

Chapter 8
Customizing NetBIOS over IP

Disabling and Reenabling NetBIOS 8-2
Specifying a TTL Value for a Rebroadcast Packet 8-2
Enabling the Insertion of Record Route Option 8-3
Configuring a NetBIOS Cache 8-4
Enabling Name Caching on the Router 8-4
Creating a MIB Instance for a Cached Name 8-6

Specifying the Size of the Name Cache 8-7
Aging a Cache Entry 8-7
Customizing a Cache Search 8-8
Customizing NetBIOS on an IP Interface 8-10
Disabling and Reenabling NetBIOS on an Interface 8-10
Disabling and Reenabling Name Caching on the Interface 8-10
Disabling Inbound and Outbound Broadcasts 8-11
Supplying a Rebroadcast Address 8-12
Configuring a Static NetBIOS Name and Address 8-13
Creating the NetBIOS Static Entry 8-13
Disabling and Reenabling Static Name Caching 8-14
Adding a Traffic Filter to a NetBIOS Interface 8-14

Chapter 9
Customizing the DNS Client

Disabling and Reenabling the DNS Client 9-2
Modifying the DNS Client Configuration 9-3
Disabling the Recursion Bit 9-5
Modifying How the DNS Client Handles Server Responses 9-6
Modifying the DNS Server List 9-7
Displaying the DNS Server List 9-7
Adding Entries to the DNS Server List 9-8
Deleting Entries from the DNS Server List 9-9
Deleting DNS Client Services from the Router 9-10

Chapter 10
Customizing the DNS Proxy

Modifying the DNS Proxy Configuration 10-1

Appendix A
Site Manager Parameters

TCP Global Parameters A-3
FTP Global Parameters A-5
TFTP Parameters A-8
Telnet Server Global Parameters A-9
Telnet Client Global Parameters A-16
NTP Parameters A-17

NetBIOS Global Parameters A-21
NetBIOS/IP Interface Table Parameters A-25
NetBIOS/IP Static Entry Table Parameters A-27
DNS Global Parameters A-29
DNS Server Record Parameters A-33
DNS Proxy Server Parameters A-34
DNS Proxy Server Record Parameters A-34
DNS Proxy Server Parameters A-39
IP Accounting Parameters A-43

Appendix B
Configuring IP Accounting on a Frame Relay Interface

Enabling IP Accounting on the Router B-2
Specifying the Maximum Size of the IP Accounting Table B-3
Controlling Notification of a Full IP Accounting Table B-3
Copying the IP Accounting Table to the Checkpoint Table B-4

Appendix C
Configuring IP Global Access Policies

Creating and Naming the Policy C-2
Specifying the IP Service C-2
Specifying the Policy Action C-3
Specifying the Precedence C-3
Specifying the Network to Which the Policy Applies C-4
Disabling and Reenabling a Policy C-4
Disabling and Reenabling Logging C-5
Global IP Access Policy Example C-5

Appendix D
BCC show Commands

Online Help for show Commands D-2
show dns server D-2
show dns stats D-3
show ftp D-3
show ntp access D-4
show ntp base D-5
show ntp peers D-5

show ntp stats D-6
show tcp connections D-6
show tcp stats D-7
show telnet D-8
show tftp D-9

Index

Figures

Figure 2-1. TCP Between IP and Clients 2-6
Figure 2-2. FTP Client and Server 2-8
Figure 2-3. Telnet Server 2-13
Figure 2-4. Telnet Client 2-14
Figure 2-5. NTP Time Servers Forming a Synchronization Subnet 2-16
Figure 2-6. NTP Time Servers Operating in Unicast Client Mode 2-19
Figure 2-7. NetBIOS over IP 2-20
Figure 2-8. Broadcasting a Name Query Request 2-22
Figure 2-9. Returning a Unicast Name Query Response 2-23

Tables

Table 2-1. TCP Reliability Features 2-3
Table 2-2. TCP Connection States 2-4
Table 2-3. FTP Commands Supported 2-9
Table 4-1. FTP Configuration Tasks 4-2
Table 6-1. Telnet Configuration Tasks 6-2
Table 7-1. NTP Configuration Tasks 7-2

Preface

IP utilities are application protocols that use the Internet Protocol (IP) for message transport. This guide describes the following IP utilities and what you do to start and customize them on a Nortel Networks™ router: TCP, FTP, TFTP, Telnet, NTP, NetBIOS over IP, DNS, and IP accounting.

You can use the Bay Command Console (BCC™) or Site Manager to configure IP utilities on a router. In this guide, you will find instructions for using both the BCC and Site Manager.

Before You Begin

Before using this guide, you must complete the following procedures. For a new router:

- Install the router (see the installation guide that came with your router).
- Connect the router to the network and create a pilot configuration file (see *Quick-Starting Routers*, *Configuring BayStack Remote Access*, or *Connecting ASN Routers to a Network)*.

Make sure that you are running the latest version of Nortel Networks BayRS™ and Site Manager software. For information about upgrading BayRS and Site Manager, see the upgrading guide for your version of BayRS.

Text Conventions

This guide uses the following text conventions:

angle brackets (< >)	Indicate that you choose the text to enter based on the description inside the brackets. Do not type the brackets when entering the command. Example: If the command syntax is: **ping** <*ip_address*>, you enter: **ping 192.32.10.12**
bold text	Indicates command names and options and text that you need to enter. Example: Enter **show ip** {**alerts** | **routes**}. Example: Use the **dinfo** command.
braces ({})	Indicate required elements in syntax descriptions where there is more than one option. You must choose only one of the options. Do not type the braces when entering the command. Example: If the command syntax is: **show ip** {**alerts** | **routes**}, you must enter either: **show ip alerts** or **show ip routes**, but not both.
brackets ([ ])	Indicate optional elements in syntax descriptions. Do not type the brackets when entering the command. Example: If the command syntax is: **show ip interfaces** [**-alerts**], you can enter either: **show ip interfaces** or **show ip interfaces -alerts**.
ellipsis points (. . .)	Indicate that you repeat the last element of the command as needed. Example: If the command syntax is: **ethernet/2/1** [<*parameter*> <*value*>] **. . .** , you enter **ethernet/2/1** and as many parameter-value pairs as needed.

italic text	Indicates file and directory names, new terms, book titles, and variables in command syntax descriptions. Where a variable is two or more words, the words are connected by an underscore. Example: If the command syntax is: **show at** <*valid_route*> *valid_route* is one variable and you substitute one value for it.
`screen text`	Indicates system output, for example, prompts and system messages. Example: `Set Trap Monitor Filters`
separator (>)	Shows menu paths. Example: Protocols > IP identifies the IP option on the Protocols menu.
vertical line (|)	Separates choices for command keywords and arguments. Enter only one of the choices. Do not type the vertical line when entering the command. Example: If the command syntax is: **show ip** {**alerts** | **routes**}, you enter either: **show ip alerts** or **show ip routes**, but not both.

Acronyms

This guide uses the following acronyms:

ARP	Address Resolution Protocol
ATM	asynchronous transfer mode
BGP	Border Gateway Protocol
DARPA	Defense Advanced Research Projects Agency (formerly ARPA)
DLSw	data link switching
DNS	Domain Name System

DoD	Department of Defense
FIFO	first in first out
FTP	File Transfer Protocol
GMT	Greenwich mean time
IEEE	Institute of Electrical and Electronic Engineers
ILI	Intelligent Link Interface
IP	Internet Protocol
MIB	management information base
NetBIOS	Network Basic Input/Output System
NTP	Network Time Protocol
PDU	protocol data unit
PVC	permanent virtual circuit
SMDS	Switched Multimegabit Data Service
SNAP	Subnetwork Access Protocol
SNMP	Simple Network Management Protocol
SRM	System Resource Module
SVC	switched virtual circuit
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TFTP	Trivial File Transfer Protocol
TTL	time to live
UDP	User Datagram Protocol
WAN	wide area network

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Sydney, Australia	61-2-9927-8800
Tokyo, Japan	81-3-5402-7041

Chapter 1
Starting IP Utilities

This chapter describes how to create a basic TCP, FTP, TFTP, Telnet, NTP, DNS, or NetBIOS over IP configuration by specifying values for required parameters only, and accepting default values for all other parameters of these services. This chapter contains the following information:

Topic	Page
Starting Configuration Tools	1-2
Configuring IP for Global Protocols	1-2
Starting TCP Services	1-4
Starting FTP Services	1-5
Starting TFTP Services	1-6
Starting Telnet Services	1-8
Starting NTP Services	1-10
Starting NetBIOS over IP	1-11
Starting the DNS Client	1-12
Starting the DNS Proxy Server	1-15

For background information about these protocols, see Chapter 2, “Overview of IP Utilities.”

Starting Configuration Tools

Before configuring TCP, FTP, TFTP, Telnet, NTP, DNS, or NetBIOS over IP services, refer to the following user guides for instructions on how to start and use the Nortel Networks configuration tool of your choice.

Configuration Tool	User Guide
Bay Command Console (BCC)	*Using the Bay Command Console (BCC)*
Site Manager	*Configuring and Managing Routers with Site Manager*

These guides also describe generically how to create and modify a device configuration.

Configuring IP for Global Protocols

Before you configure any IP utility using the BCC or Site Manager, you must first start IP on the router. You can configure IP using either the BCC or Site Manager.

For information about how to customize IP by modifying IP global and interface parameters, see *Configuring IP, ARP, RARP, RIP, and OSPF Services*.

Using the BCC

To start IP on the router:

1. Configure a physical interface on an available slot/connector.
2. Configure an IP interface on the physical interface.

Step 1: Configuring a Physical Interface

To configure a physical interface on a slot and connector, navigate to the top-level box or stack prompt and enter:

<interface_type> **slot** <*slot_number*> [**module** *<module_number>*] **connector** <*connector_number*>

- *interface_type* is the name of a link or net module on the router.

- *slot_number* is the number of the slot in which the link or net module is located.
- *module_number* is the net module number (ASN™ and System 5000™ routers only).
- *connector_number* is the number of a connector on the link or net module.

For example, the following command configures an Ethernet interface on slot 2, connector 2:

```
box# ethernet slot 2 connector 2
ethernet/2/2#
```

Step 2: Configuring an IP Interface

To configure an IP interface on a physical interface, navigate to the prompt for the physical interface and enter:

ip address <*address*> **mask** <*mask*>

address and *mask* are a valid IP address and its associated subnet mask, expressed in either dotted-decimal notation or in bit notation.

For example, the following command configures IP interface 2.2.2.2/255.0.0.0 on an Ethernet physical interface on slot 2, connector 2:

```
ethernet/2/2# ip address 2.2.2.2 mask 255.0.0.0
ip/2.2.2.2/255.0.0.0#
```

An IP interface is now configured on the Ethernet interface with default values for all interface parameters. When you configure an IP interface, the BCC also configures IP globally on the router with default values for all IP global parameters.

Using Site Manager

Before you can select a protocol to run on the router, you must configure a circuit that the protocol can use as an interface to an attached network. For information and instructions, see *Configuring WAN Line Services* and *Configuring Ethernet, FDDI, and Token Ring Services.*

When you have successfully configured the circuit, the Select Protocols window opens. Proceed as follows:

Site Manager Procedure	
You do this	**System responds**
1. In the Select Protocols window, select **IP**. Then click on **OK**.	The IP Configuration window opens.
2. Set the following parameters: • **IP Address** • **Subnet Mask** • **Transmit Bcast Addr** • **UnNumbered Assoc Address** Click on **Help** or see the parameter descriptions in *Configuring IP, ARP, RARP, RIP, and OSPF Services*.	
3. Click on **OK**.	Site Manager displays a window asking if you want to enable TFTP on the router.
4. Click on **Yes** to enable TFTP. Otherwise, click on **No**.	You return to the Configuration Manager window.

Starting TCP Services

You can use the BCC or Site Manager to start TCP on the router, accepting default values for all parameters. If you decide to change some or all of the default values, see Chapter 3, "Customizing TCP Services."

Before you begin, verify that you configured IP on an interface. For instructions, see "Configuring IP for Global Protocols" on page 1-2.

Using the BCC

To configure TCP on the router with default settings, begin in configuration mode at the box or stack prompt:

1. **Go to the global IP prompt.**

```
box# ip
ip#
```

2. **Configure TCP.**

```
ip# tcp
```

3. **Display TCP default settings.**

```
tcp# info
   min-rto 250
   max-rto 240000
   max-win 4096
   state enabled
tcp#
```

Using Site Manager

To start TCP services, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **TCP**.	The TCP menu opens.
4. Choose **Create TCP**.	You return to the Configuration Manager window.

Starting FTP Services

You can use the BCC or Site Manager to configure FTP on the router, accepting default values for all parameters. If you decide to change some or all of the default values, see Chapter 4, “Customizing FTP Services.”

Before you begin, verify that IP is configured on an interface. For instructions, see “Configuring IP for Global Protocols” on page 1-2.

Using the BCC

To start FTP on the router with default settings, begin in configuration mode at the box or stack prompt:

1. **Configure FTP.**

```
box# ftp
ftp#
```

2. **Display FTP default settings.**

```
ftp# info
   default-volume 2
   login-retries 3
   idle-timeout 900
   max-sessions 3
   tcp-window-size 60000
   state enabled
ftp#
```

Using Site Manager

Before you can start FTP services, you must first start TCP (see "Starting TCP Services" on page 1-4). To start FTP services, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Create FTP**.	Site Manager creates FTP on the router.

Starting TFTP Services

You can use the BCC or Site Manager to configure TFTP on the router, accepting default values for all parameters.

Note: If the configuration file is already on the router, then you must enable TFTP using the BCC or the Technician Interface.

If you decide to change some or all of the default values, see Chapter 5, "Customizing TFTP Services."

Before you begin, verify that IP is configured on an interface. For instructions, see "Configuring IP for Global Protocols" on page 1-2.

Using the BCC

To start TFTP on the router with default settings, begin in configuration mode at the box or stack prompt:

1. **Configure TFTP**.

```
box# tftp
tftp#
```

2. **Display TFTP default settings**.

```
tftp# info
   default-volume 2
   retry-timeout 5
   close-timeout 25
   retry-count 5
   state enabled
tftp#
```

Using Site Manager

To start TFTP from Site Manager, first complete the following tasks in local mode to create a configuration file:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	A confirmation window opens.
4. Choose **Create**.	You return to the Configuration Manager window.

After you create the configuration file, you must transfer this file to the router for TFTP to be enabled.

Starting Telnet Services

You can use the BCC or Site Manager to configure Telnet services on the router, accepting default values for all parameters. If you decide to change some or all of the default values, see Chapter 6, “Customizing Telnet Services.”

Before you begin, verify that IP is configured on an interface. For instructions, see “Configuring IP for Global Protocols” on page 1-2.

Using the BCC

To start a Telnet server on the router with default settings, begin in configuration mode at the box or stack prompt:

1. **Configure Telnet services.**

```
box# telnet
telnet#
```

2. **Configure a Telnet server.**

```
telnet# server
```

3. **Display Telnet server default settings.**

```
server# info
   manager-script automgr.bat
   lines 24
   more enabled
   prompt {}
   login-timeout 1
   password-timeout 1
   command-timeout 15
   login-retries 3
   auto-user-script {}
   force-logout disabled
   history 20
   state enabled
server#
```

To start a Telnet client on the router with default settings, navigate to the Telnet prompt:

1. **Configure a Telnet client**.

```
telnet# client
```

2. **Display Telnet client default settings**.

```
client# info
    debug-log-flag off
    remote-port 23
    prompt {}
    state enabled
client#
```

Using Site Manager

Before you can start Telnet services, you must first start TCP (see "Starting TCP Services" on page 1-4). To start a Telnet server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Create Telnet Server**.	The Telnet Configuration window opens, allowing you to customize Telnet server global parameters.

To start a Telnet client, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Client**.	The Telnet Client menu opens.
4. Choose **Create Telnet Client**.	You return to the Configuration Manager window.

Starting NTP Services

You can use the BCC or Site Manager to configure NTP on the router, accepting default values for all parameters. If you decide to change some or all of the default values, see Chapter 7, "Customizing NTP Services."

Before you begin, verify that:

- IP is configured on an interface. For instructions, see "Configuring IP for Global Protocols" on page 1-2.
- The remote time servers that you want to configure on the network are reachable via IP.

  To do this, you must ping the IP address of the time server that you want to configure. If the time server is not on the local network, you must configure the appropriate IP routing protocol, such as RIP or OSPF. For information about configuring routing protocols, see *Configuring IP, ARP, RARP, RIP, and OSPF Services*.

Using the BCC

To start NTP services on the router with default settings, begin in configuration mode at the box or stack prompt:

1. **Configure NTP.**

```
box# ntp
ntp#
```

2. **Display NTP default settings.**

```
ntp# info
   state enabled
ntp#
```

Using Site Manager

To start NTP services, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Create NTP**.	Site Manager creates NTP on the router.

Starting NetBIOS over IP

You can start NetBIOS over IP and configure it on a circuit using Site Manager default parameter values. If you decide to change some or all of the default values, see Chapter 8, “Customizing NetBIOS over IP.”

Before you begin, verify that IP is configured on an interface. For instructions, see “Configuring IP for Global Protocols” on page 1-2.

To start NetBIOS over IP, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, click on the connector to which you want to add NetBIOS services.	The Edit Connector window opens.
2. Click on **Edit Circuit**.	The Circuit Definition window opens.
3. Choose **Protocols**.	The Protocols menu opens.
4. Choose **Add/Delete**.	The Select Protocols window opens.
5. Click on **NetBIOS**.	
6. Click on **OK**.	You return to the Circuit Definition window.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
7. Choose **File**.	The File menu opens.
8. Choose **Exit**.	You return to the Configuration Manager window.

Starting the DNS Client

You can use the BCC or Site Manager to configure DNS client services on the router, accepting default values for all parameters. If you decide to change some or all of the default values, see Chapter 9, “Customizing the DNS Client.”

Before you begin, verify that IP is configured on an interface. For instructions, see “Configuring IP for Global Protocols” on page 1-2.

Using the BCC

To start a DNS client on the router with default settings, begin in configuration mode at the box or stack prompt:

1. **Configure DNS**.

```
box# dns
dns#
```

2. **Display DNS default settings**.

```
dns# info
time-out 5
max-retransmissions 3
max-outstanding-queries 20
tos low-delay
domain-name {}
recursion enabled
ignore-truncation enabled
authoritative-only disabled
use-default-domain enabled
hosts-file {}
state enabled
```

After you create and enable the DNS client, you must specify at least one DNS server. You can specify up to three servers.

To designate a DNS server for the DNS client on the router, navigate to the DNS prompt and enter:

name-server <*number*> **address** <*ip_address*>

number is 1, 2, or 3.

ip_address is the IP address of the DNS server.

For example, the following command specifies DNS name server 1 at IP address 192.32.75.9 and displays default DNS name server parameters:

```
dns# name-server 1 address 192.32.75.9
name-server/1# info
   number 1
   address 192.32.75.9
   port 53
```

Using Site Manager

To create and enable the DNS client, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols.**	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **Create DNS Client**.	The DNS Configuration window opens.
5. Click on **OK**.	You return to the Configuration Manager window.

After you create and enable the DNS client, you must specify at least one DNS server. You can specify up to three DNS servers. To specify a DNS server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols.**	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **DNS Servers**.	The DNS Server List window opens.
5. Click on **Add**.	The DNS Server Record window opens.
6. Set the following parameters: • **Index** • **IP Address** • **Port Number** Click on **Help** or see the parameter descriptions beginning on page A-33.	
7. Click on **OK**.	You return to the DNS Server List window.
8. Click on **Done**.	You return to the Configuration Manager window.

Starting the DNS Proxy Server

You can use Site Manager to configure DNS proxy server services on the router, accepting default values for all parameters. If you decide to change some or all of the default values, see Chapter 10, "Customizing the DNS Proxy."

Before you can create the DNS proxy server, first configure an IP interface. For instructions, see "Configuring IP for Global Protocols" on page 1-2.

You must specify at least one DNS server for which the router will act as a proxy. You can specify up to three DNS servers. To configure the DNS proxy server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols.**	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **DNS Proxy**.	The DNS Proxy List window opens.
5. Click on **Add**.	The DNS Proxy Record window opens.
6. Set the following parameters: • **IP Address** • **DNS Server 1** • **DNS Server 2** • **DNS Server 3** (The second and third DNS server addresses are optional.) Click on **Help** or see the parameter descriptions beginning on page A-33.	
7. Click on **OK**.	You return to the DNS Proxy List window; it now shows the values that you configured.
8. Click on **Apply**, and then click on **Done**.	You return to the Configuration Manager window.

Chapter 2
Overview of IP Utilities

This chapter describes the concepts behind TCP, FTP, TFTP, Telnet, NTP, DNS, and NetBIOS over IP services and how Nortel Networks routers implement them. You can use this information to decide how to customize TCP, FTP, TFTP, Telnet, NTP, DNS, and NetBIOS over IP parameters for your system.

Topic	Page
TCP Overview	2-1
FTP Overview	2-7
TFTP Overview	2-10
Telnet Overview	2-11
NTP Overview	2-15
NetBIOS Overview	2-20
DNS Overview	2-24

TCP Overview

In the 1970s, the Defense Advanced Research Projects Agency (DARPA) of the U.S. Department of Defense (DOD) developed the Transmission Control Protocol (TCP) to provide communication among hosts manufactured by different vendors. DARPA designed TCP to work within a layered hierarchy of networking protocols, using the Internet Protocol (IP) to transfer data.

Built upon the IP layer suite, TCP is a connection-oriented, end-to-end protocol that provides the packet sequencing, error control, and other services required to provide reliable end-to-end communications. IP takes the packet from TCP and passes it along whatever gateways are needed, for delivery to the remote TCP layer through the remote IP layer.

The Nortel Networks implementation of TCP generally ensures good terminal server performance on slow-speed as well as high-speed LAN links. TCP services are required to support upper-layer protocols, such as Telnet and FTP, which are part of the TCP/IP suite.

TCP does not require reliability of the communication protocols below itself. Therefore, TCP functions with lower-level protocols that are simple, potentially unreliable datagram services. TCP uses IP for a lower-level protocol.

How TCP Works

TCP is connection-oriented. Therefore, before transferring data, you must first establish a logical transport layer connection with a peer user. To establish this connection, TCP uses what is sometimes called a “three-way handshake,” in which the initiating TCP sends a Protocol Data Unit (PDU) with a synchronize (SYN) bit set to 1 in its header. The responding TCP then sends back a PDU with both the SYN bit and the Acknowledged (ACK) bit set, and possibly, some user data. Time and, if necessary, retransmission are used to recover PDUs lost in this process, allowing each side to indicate its starting sequence number. Because of the possibility of lost or delayed PDUs, this three-way exchange ensures that connections are established correctly.

Data transfer is straightforward, and follows the procedures for flow control and acknowledgment. TCP performs all acknowledgment and assigns all credits in terms of octets. A credit of eight (8), then, allows sending only 8 octets of data, not 8 PDUs.

To release a connection, one TCP sends a PDU with the FIN flag set and a sequence number one greater than that assigned to the last octet of the transmitted data. Upon receipt of this PDU, the responding TCP sends back a PDU carrying an ACK for the FIN’s sequence number and a FIN of its own (this ACK or FIN may appear in the same PDU or in different PDUs). The TCP that sent the first FIN must respond with an ACK for this new FIN. This rather complex procedure allows a graceful close, ensuring that no data is lost during release of the connection.

TCP Features

Because IP does not always guarantee reliable transfer of data, TCP implements several reliability features to ensure that data arrives at its destination uncorrupted and in the order sent. Table 2-1 describes these features.

Table 2-1. TCP Reliability Features

Feature	Description
Sequence numbers	TCP assigns a sequence number to each data segment it transmits. The receiving host uses the sequence numbers to make sure that all the data arrives in order. TCP assigns sequence numbers on a per-octet basis, so the value in this field is actually the sequence number of the first octet of the user data.
Out-of-order caching	As TCP receives data segments, it puts them in sequential order and forwards them to the receiving TCP client. If TCP fails to receive one or more segments and cannot complete the sequential ordering, it stores the remaining segments in cache memory for as long as the TCP connection exists. When TCP receives the missing segments, it takes the stored segments from cache memory, puts them into sequential order with the newly received segments, and then forwards them to the receiving TCP client. Out-of-order caching ensures that data arrives in the correct order while saving bandwidth and retransmission time.
Checksums	To ensure the integrity of the data, the sending host adds a checksum to each segment it transmits. The receiving host recalculates the checksum, and if there is damage, discards the segment.
Flow control	Flow control allows the receiving host to regulate how much data is sent to it. To activate flow control, the receiving host advertises a *window* that indicates how much data it can accept. When the transmit window is full, the sending host must stop sending data until the receiving host can open the window again. To control the rate of data transfer on your TCP connections, you can specify the maximum window size allowed for each connection.
Acknowledgment with retransmission	TCP requires the receiving host to acknowledge that it has received the data. If the sending host does not receive an acknowledgment within a set timeout interval, the sending station retransmits the data. TCP determines the timeout interval by estimating the average time it takes to send a segment and receive an acknowledgment for it.

Connection Types

TCP is a connection-oriented protocol that requires application programs at both ends of a connection to agree to it before TCP traffic can pass across a network. To do so, the application program at one end performs a passive open while the application program at the other end performs an active open. For passive opens, a TCP client (the process or application program that uses TCP) waits to accept incoming connection requests. Clients using passive opens can listen for specific connection requests or for a range of inbound requests. In an active open, the client initiates the connection. Once a connection has been created, application programs can begin to pass data; that is, the programs at each end exchange messages that guarantee reliable delivery.

Connections and Connection States

TCP establishes a set of access points, referred to as *ports*, for each host. It associates each port with a network and host address to form a *socket*. A pair of sockets, together with sequence numbers, window sizes, and status information, form a *TCP connection*.

Table 2-2 lists the states through which a TCP connection proceeds during its lifetime.

Table 2-2. TCP Connection States

State	Definition
LISTEN (2)	TCP listens for a connection request from any remote TCP.
SYN SENT (3)	TCP has sent a connection request (SYN segment) and waits for a matching connection request and acknowledgment from the remote TCP.
SYNRECEIVED (4)	TCP has sent a connection request, received a matching request, and waits for a confirming connection request acknowledgment from the remote TCP.
ESTABLISHED (5)	Connection open. Data can be received and sent. This is the normal state for the data transfer phase of the connection.
FINWAIT-1 (6)	TCP waits for a connection termination request (FIN segment) from the remote TCP, or for an acknowledgment of a previously sent connection termination request.

(continued)

Table 2-2. TCP Connection States *(continued)*

State	Definition
FINWAIT-2 (7)	TCP waits for a connection termination request from the remote TCP.
CLOSEWAIT (8)	TCP waits for a connection termination request from the client.
CLOSING (10)	TCP waits for a connection termination request acknowledgment from the remote TCP.
LASTACK (9)	TCP waits for acknowledgment of the connection termination request previously sent to the remote TCP.
TIMEWAIT (11)	TCP waits for enough time to pass to ensure that the remote TCP received the acknowledgment of its connection termination request.
CLOSED (1)	No connection.

TCP Memory Considerations

The Transmission Control Protocol requires a significant amount of memory to:

- Retain copies of outbound data in case they must be retransmitted.
- Retain copies of inbound data in case they are received out of order and must be rearranged.
- Manage the TCP connections.

The amount of memory used per TCP connection is dynamic. Each connection uses a small amount of overhead memory (less than 1 KB), even if the connection is idle. As the size of the transmit-and-receive window increases, so does the memory for connections. It expands as much as TCP allows.

You can control the window size by setting a value for the Max. For information on the Window Size parameter in the Edit TCP Global Parameters window, see Chapter 3, “Customizing TCP Services.” The maximum amount of memory TCP can use for a connection is equal to the overhead memory plus twice the window size (because the window can fill in both directions).

The value you set for the maximum window size depends on how much memory you need for services other than TCP. If you have a complicated configuration, specify a low Max. Window Size value for TCP connections, since space is limited. Systems with less involved configurations can support more TCP connections and a higher maximum window size value.

If TCP consumes too much memory on the router, connections slow down or even abort. TCP uses feedback mechanisms to indicate to clients when resources are becoming scarce. However, if clients disregard this feedback, TCP has to break connections. TCP attempts to monitor and break the connections consuming the most memory, to maintain connections consuming less memory.

TCP and IP Service Users

TCP is the layer between IP and protocols running at higher layers in the network hierarchy. Figure 2-1 shows a simple network architecture with four users of TCP/IP services: data link switching (DLSw), Telnet, FTP, and BGP.

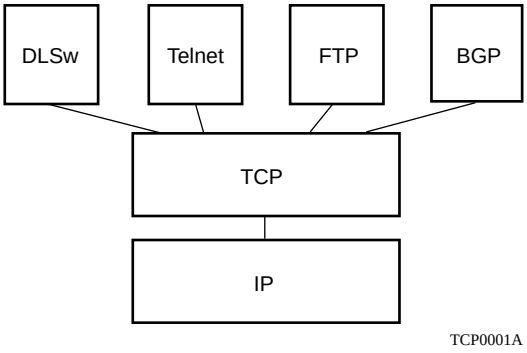

Figure 2-1. TCP Between IP and Clients

The interface between TCP and programs that use TCP consists of a set of messages exchanged between the clients and TCP, and a set of functions and macros that user programs call to exchange TCP messages. These programs use the functions and macros to:

- Open, close, abort, and get the status of connections.
- Control the flow of data.
- Encapsulate data for TCP to transmit.
- Process received TCP data.

When a program passes data to TCP, the TCP layer formats the data and calls on the IP layer to transmit the data to its destination.

For information about creating TCP on the router, see Chapter 1, “Starting IP Utilities.” For information about editing TCP parameters, see Chapter 3, “Customizing TCP Services.”

FTP Overview

The File Transfer Protocol allows files to be transferred from a server to an FTP client or from an FTP client to the server. FTP ensures the integrity of data transferred from one system to another.

Using FTP, you can log in to a remote host, identify yourself, list remote directories, copy files to or from the remote host, and execute a few simple commands remotely.

When you enable FTP on the router, you can:

- Download files from a host system to a remote router and retrieve files from the router.
- Examine the directory listing of files on the remote router.
- Delete files on the remote router.

For information about creating the FTP server on the router, see Chapter 1, “Starting IP Utilities.” For information about editing FTP parameters, see Chapter 4, “Customizing FTP Services.”

How FTP Works

The FTP client initiates an FTP session with the FTP server on the router. The session establishes two separate connections between host and router as follows:

- Control connection -- the communication path between the FTP client and the FTP control server for the exchange of commands and replies used for sending a command request or response.
- Data connection -- a full-duplex connection over which data is transferred in a specified mode and type between FTP client and FTP server.

The FTP client residing on the host and the FTP server residing on the router rely on the underlying support of TCP and IP for the reliable, sequenced transfer of data and control messages (Figure 2-2).

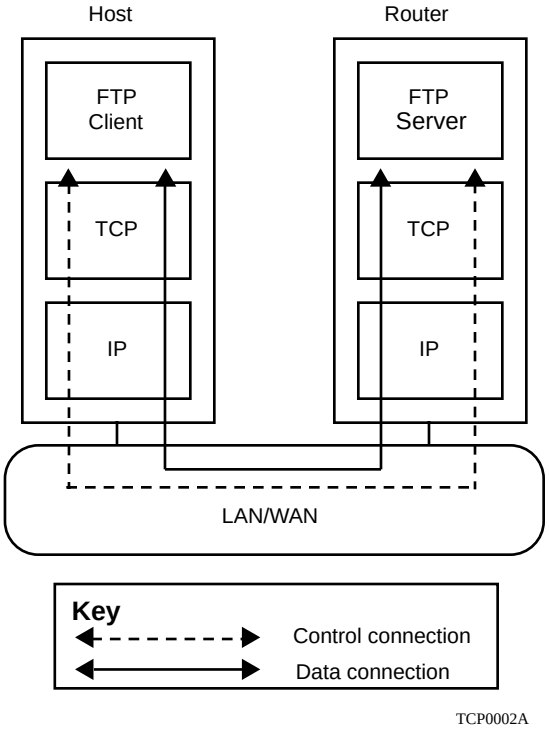

Figure 2-2. FTP Client and Server

Table 2-3 describes the FTP commands that the FTP server supports on Nortel Networks routers.

Table 2-3. FTP Commands Supported

Command	Code	Description
Access Control Commands		
User Name	USER	Initiates an FTP session for the user.
Password	PASS	Specifies a user's encrypted identification for access control.
Logout	QUIT	Terminates the session and closes the control connection.
Transfer Parameter Commands		
Data Port	PORT	Specifies the data port to be used in the data connection.
Representation Type	TYPE	Specifies the data transfer type. The server supports transfer of ASCII and image (binary) data.
Transfer Mode	MODE	Specifies the transfer mode. The server supports stream mode only.
File Structure	STRU	Specifies the file structure type. The server supports file (no record) structure only.
FTP Service Commands		
Retrieve	RETR	Causes the server to transfer the specified file to the client.
Abort	ABOR	Causes the server to abort the previous FTP service command and any associated transfer of data.
Store	STOR	Causes the server to accept the data transferred over the data connection and store it on the server.
Store Unique	STOU	Specifies the same operation as the **Store** command and, in addition, causes the server to create the resulting file in the current directory under a name unique to that directory.
Delete	DELE	Causes the server to delete the specified file on the server.
List	LIST	Causes the server to send to the client a detailed list of files.
Name List	NLST	Causes the server to send to the client a list of file names.
Status	STAT	Causes the server to send to the client the control connection status. If the server receives the command during file transfer, the server sends the client the status of the transfer.
Help	HELP	Provides helpful information.
No Operation	NOOP	Specifies no action. Causes the server to send an OK reply.

(continued)

Table 2-3. FTP Commands Supported *(continued)*

Command	Code	Description
Change Working Directory	CWD	Causes the server to change the volume.
Print Working Directory	PWD	Causes the server to print its current working directory.
Implementation-specific FTP Commands		
Compact	COMP	Causes the server to compact the flash card. Use this command after the **delete** command, or when the amount of contiguous space is low. You can determine the amount of contiguous space on a router by using the **dir** command.

TFTP Overview

The Trivial File Transfer Protocol (TFTP) is a TCP/IP standard protocol for transferring files with minimum capability and minimal overhead. TFTP is implemented on top of the unreliable connectionless datagram delivery service and is used to move files between network devices.

TFTP was designed to be small and easy to implement. Because it is small, it is more restrictive, lacking most of the features of the File Transfer Protocol (FTP). TFTP provides inexpensive, unsophisticated file-transfer service only. It cannot list directories and provides no authentication.

TFTP runs on top of the User Datagram Protocol (UDP) and uses timeout and retransmission to ensure that data arrives. Each file transfer begins with a request to read or write to a file; this request also serves to ask for a connection. If the server grants the request, the connection is opened and the file is sent in fixed-length blocks (data packets) of 512 bytes. Each data packet contains one block of data and must be acknowledged by an acknowledgment packet before the next packet is sent. A data packet of less than 512 bytes terminates the transfer.

If a packet gets lost in the network, the intended recipient will time out and may retransmit its last packet (which can be data or an acknowledgment), causing the sender of the lost packet to retransmit the packet. Because the lock-step acknowledgment guarantees that all older packets have been received, the sender keeps one packet only on hand for transmission.

Both devices involved in a TFTP transfer are senders and receivers. One device sends data and receives acknowledgments; the other device sends acknowledgments and receives data.

The IP router includes a client and server implementation of TFTP, enabling the router to transmit and receive files across a network.

For information about creating TFTP on the router, see Chapter 1, “Starting IP Utilities.” For information about editing TFTP parameters, see Chapter 5, “Customizing TFTP Services.”

Telnet Overview

Telnet is a virtual terminal protocol that is part of the TCP/IP protocol suite. It allows you to access any system on your network running the Telnet server software. Accessing Telnet establishes a virtual connection between your terminal and the specified host. Once you connect to a host through Telnet, your terminal appears to be connected directly to that host.

Telnet offers three basic services:

- It defines a network virtual terminal that provides a standard interface to remote systems. Clients do not have to understand the details of all possible remote systems; they are built to use the standard interface.
- It allows client and server to negotiate options, and it provides a set of standard options.
- It treats both ends of the connection symmetrically. So, instead of forcing the client side to connect to a user’s terminal, Telnet allows an arbitrary program to become a client. Furthermore, either end of the connection can negotiate options.

Telnet is used primarily to access the Technician Interface. You can execute Technician Interface commands from a remote host (inbound Telnet) or originate an outgoing Telnet session (outbound Telnet) to another Nortel Networks router or network device that accepts Telnet. You use outbound Telnet to access remote routers when Site Manager or Simple Network Management Protocol (SNMP) is unavailable.

To use Telnet to access the Technician Interface, you must assign at least one IP address to the router. The number of Telnet connections you can make to the Technician Interface is limited only by the availability of system resources (that is, system memory).

Note: We recommend that you establish no more than one Telnet session per router.

Before you can enable Telnet on the router, you must first create TCP. After you create TCP, you can create a Telnet server and Telnet client and modify their default parameters. For information about creating TCP and Telnet on the router, see Chapter 1, “Starting IP Utilities.” For information about modifying Telnet default parameters, see Chapter 6, “Customizing Telnet Services.”

Telnet Server

When you create a Telnet server, the router accepts inbound requests from a Telnet client and establishes a Telnet session to the Technician Interface.

A PC with a network configuration can run a Telnet terminal emulation program to establish a remote session on a router (Figure 2-3). In this case, the PC is defined as a Telnet client and the router as a Telnet server.

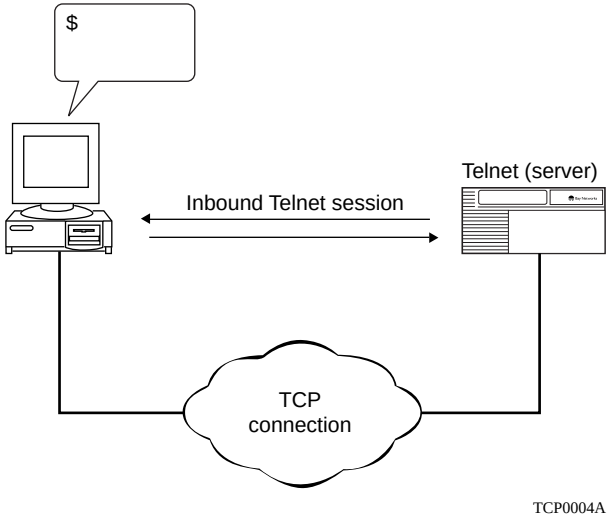

Figure 2-3. Telnet Server

Telnet Client

When you create a Telnet client, the router sends outbound requests to a remote host to establish a Telnet session on a remote node. After the router establishes the Telnet session, you can access all Technician Interface commands.

If you have established a terminal/console cable connection to a router, you can log in to the local router and use the Telnet command to establish a remote session on a remote router (Figure 2-4). In this case, the local router is defined as the Telnet client and the remote router as the Telnet server.

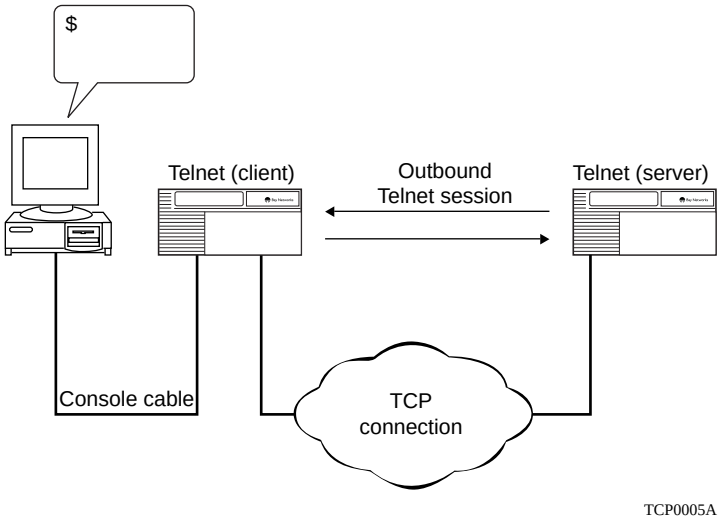

Figure 2-4. Telnet Client

NTP Overview

The Network Time Protocol (NTP) synchronizes the timing of internal clocks of various network devices across large, diverse networks to universal standard time. NTP runs over UDP, which in turn runs over IP. The NTP protocol specification is documented in RFC 1305.

Each device on the network contains an internal system clock that is used to maintain accurate time for the device. The internal system clock on most local devices is set by eye or by wristwatch to within a minute or two of the actual time and is rarely reset at regular intervals. Many of these clocks are battery-backed devices that use room temperature clock oscillators that can drift as much as several seconds each day. NTP solves this problem by automatically adjusting the time of the devices so that they are synchronized within milliseconds.

The current implementation of NTP supports only NTP client mode. In this mode, the local NTP client, which runs on a router, accepts time information from other remote time servers and adjusts its clock accordingly. However, the NTP local client will not attempt to synchronize another device's clock.

NTP Terminology

An NTP peer can be any device that runs NTP software. However, the current implementation of NTP refers to peers as remote time servers that provide time information to other time servers on the network and to the local NTP client. An NTP client refers to the local network device -- in this case a router -- that accepts time information from other remote time servers.

NTP System Implementation Model

NTP is based on a hierarchical model that consists of a local *NTP client*, which runs on the router, and a number of remote time servers. The NTP client sends requests for time information (NTP messages) to and receives time information from one or more remote time servers. The local NTP client reviews the time information from all available time servers and synchronizes its internal clock to the time servers whose time is most accurate. The NTP client does not forward time information to other devices running NTP.

There are two types of time servers in the NTP model: *primary time servers* and *secondary time servers.* A primary time server is directly synchronized to a primary reference source, usually a wire or radio clock that is synchronized to a radio station that provides a standard time service. The primary time server is the authoritative time source in the hierarchy, meaning that it is the one true time source to which the other NTP devices in the subnet will synchronize their internal clocks.

A secondary time server synchronizes its time from a primary time server or from one or more secondary time servers to form a synchronization subnet (see Figure 2-5). A synchronization subnet is a self-organizing, hierarchical master-slave configuration with the primary servers at the root and the secondary servers of decreasing accuracy at successive levels from the primary servers.

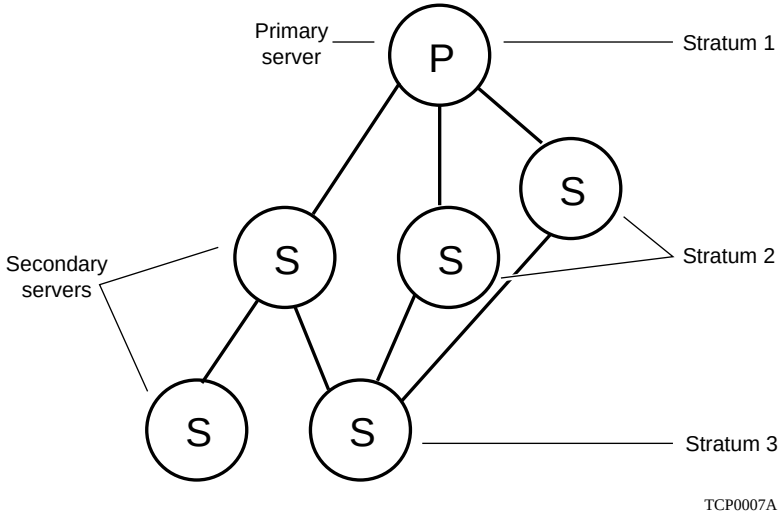

Figure 2-5. NTP Time Servers Forming a Synchronization Subnet

In the NTP model, the synchronization subnet automatically reconfigures in a hierarchical master-slave configuration to produce the most accurate and reliable time, even when one or more primary time servers or the network path between them fails. This includes a case in which all the primary servers on a partitioned subnet fail, but one or more backup primary servers continue to operate. Should all primary time servers in the subnet fail, the remaining secondary servers will synchronize among themselves.

How NTP Distributes Time Within the Subnet

NTP distributes time through a hierarchy of primary and secondary time servers, with each server adopting a “stratum” (see Figure 2-5 on page 2-16). A “stratum” defines how many NTP “hops” away a particular secondary time server is from an authoritative time source (primary time server) in the synchronization subnet. A “stratum 1” time server, located at the top of the hierarchy, is directly attached to an external time source, typically a wire or radio clock; a “stratum 2” time server receives its time via NTP from a “stratum 1” time server; a “stratum 3” time server receives its time via NTP from a “stratum 2” time server, and so forth.

Each NTP client in the synchronization subnet chooses as its time source the server with the lowest stratum number that it is configured to communicate with via NTP. This strategy effectively builds a self-organizing tree of NTP speakers. The number of strata is limited to 15 to avoid long-lived synchronization loops.

NTP tries not to synchronize to a remote time server whose time might not be accurate. It avoids doing this in two ways. First, NTP never synchronizes to a remote time server that is not in turn synchronized itself. Second, NTP compares the time reported by several remote time servers, and will not synchronize to a remote time server whose time is markedly different from the others, even if its stratum is lower.

Synchronizing with the Best Available Time Server

Unlike other implementations of time synchronization protocols, NTP does not attempt to synchronize the remote time server’s internal clocks to each other. Rather, NTP achieves time synchronization by synchronizing their clocks to universal standard time using the “best” available time source and transmission paths to that time source.

NTP uses the following criteria to determine the time server whose time is best:

- Time server with the lowest stratum
- Time server closest in proximity to the primary time server (reduces network delays)
- Time server offering the highest claimed precision

NTP prefers to have access to several (at least three) servers at the lower stratum level, since it can apply an agreement algorithm to detect a problem on any part of the time source.

NTP Modes of Operation

NTP provides three modes of operation (or associations) in which time servers and NTP clients can communicate with each other in the synchronization subnet: unicast client mode, broadcast client mode, and multicast client mode. Currently, Nortel Networks supports only NTP client mode.

NTP forms an association when two remote time servers exchange messages and one or both of them create and maintain an instantiation of the router.

Unicast Client Mode

Unicast client mode is the recommended mode of operation. Use unicast client mode to configure a set of remote time servers (or peers) for time synchronization. You can also configure access control filters for time servers in unicast client mode, but normally you would perform this operation in broadcast client or multicast client mode. For more information about performing these tasks, see Chapter 7, “Customizing NTP Services.”

When you configure a set of remote time servers (peers), NTP creates a peer list that includes each time server’s IP address. The NTP client uses the peer list to determine which remote time servers to query for time information. When the NTP client queries the remote time servers, they respond with various timestamps, along with information about their clocks, such as stratum, precision, and time reference (Figure 2-6). The NTP client reviews the list of responses from all the available servers and chooses one as the “best” available time source from which to synchronize its internal clock.

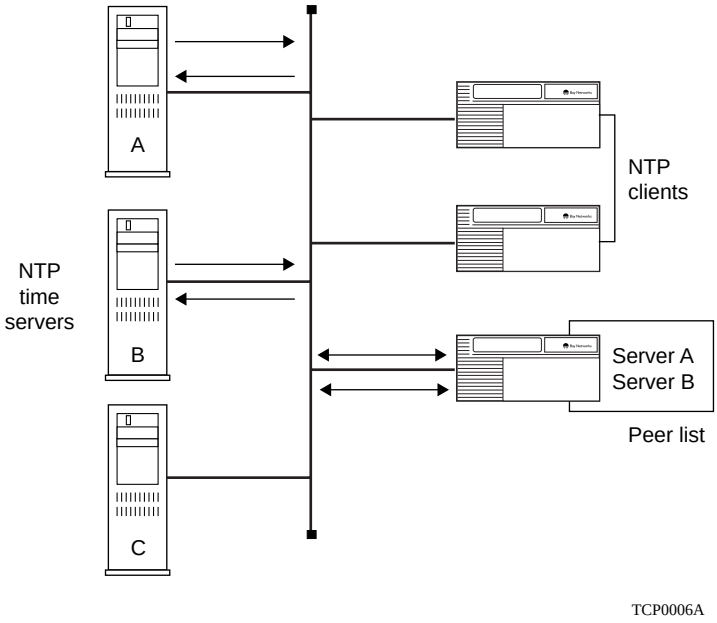

Figure 2-6. NTP Time Servers Operating in Unicast Client Mode

Broadcast and Multicast Client Mode

In broadcast client and multicast client modes, the local NTP client will accept NTP packets from every remote time server, provided that the IP destination address of the NTP packet matches the IP broadcast address of the local NTP client. After the NTP client receives NTP packets, it applies rules to select the remote time server with the greatest accuracy.

In broadcast client and multicast client modes, you can restrict specific time servers from sending NTP packets to an NTP client by configuring access control filters. You cannot, however, configure peers in either broadcast client or multicast client mode.

Nortel Networks recommends that you use broadcast client mode and multicast client mode when you have many clients on the network and only one remote time server, as broadcasting reduces overall traffic volume on the network.

NetBIOS Overview

The Network Basic Input/Output System (NetBIOS) is a session layer communications service used by client and server applications in IBM token ring and PC LAN networks.

NetBIOS provides applications with a programming interface for sharing services and information across a variety of lower-layer network protocols, including IP. Figure 2-7 shows the position of NetBIOS and IP in a simple network architecture.

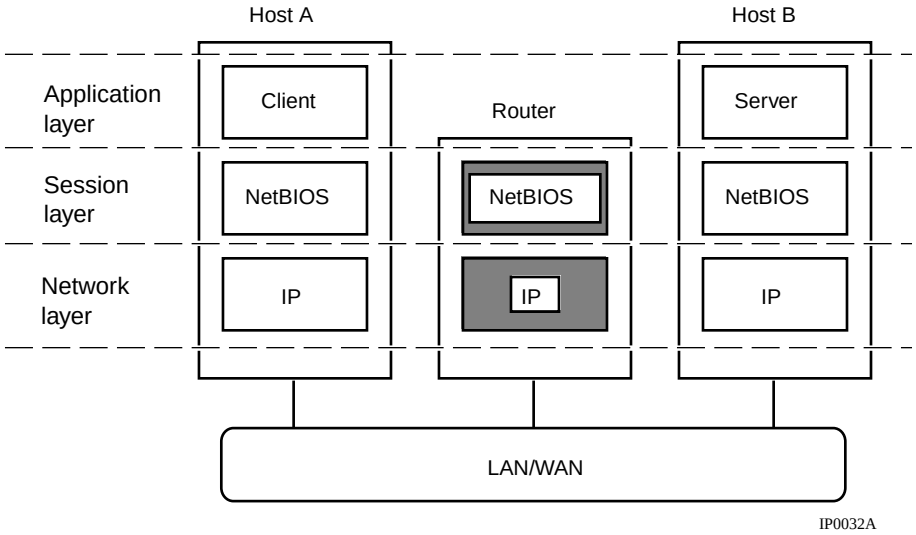

Figure 2-7. NetBIOS over IP

There are three categories of NetBIOS services: the name service, the session service, and the datagram service.

The NetBIOS *name service* allows an application to:

- Verify that its own NetBIOS name is unique. The application issues an add name query to NetBIOS. NetBIOS broadcasts the add name query, containing the name. NetBIOS applications that receive the query return an add name response or a name-in-conflict response. If no response to the query is received after (typically) six broadcasts, the name is considered to be unique.
- Delete a NetBIOS name that the application no longer requires.

- Use a server's NetBIOS name to determine the server's network address. The application issues a name query request to NetBIOS, containing the target server's NetBIOS name. NetBIOS broadcasts the name query request. The server that recognizes the name returns a name query response containing its network address.

The NetBIOS *session service* allows an application to conduct a reliable, sequenced exchange of messages with another application. The messages can be up to 131,071 bytes long.

The NetBIOS *datagram service* allows an application to exchange datagrams with a specific application or to broadcast datagrams to a group and receive datagrams from the group. Datagrams allow applications to communicate without establishing a session. When a NetBIOS application wants to send information that does not require acknowledgment from the destination application, the application can transmit a NetBIOS datagram.

NetBIOS in an IP Environment

The NetBIOS name service and datagram service rely on the capability of the underlying network to broadcast name query requests to all NetBIOS applications. In a NetBIOS over IP environment, it is the responsibility of the IP router to ensure that the broadcast queries reach all appropriate network segments. To do this, the router:

1. Analyzes each NetBIOS packet received on any NetBIOS interface to determine whether the packet is a broadcast packet
2. Rebroadcasts each broadcast packet out all appropriate interfaces, except the one on which it was received (readdressing the packet if required)

If alternate paths exist between different network segments, broadcasting loops can occur. To prevent such loops, the router:

1. Stamps the data portion of the IP packet with the IP address of the router from which the packet was rebroadcast
2. Parses the IP addresses included in the data portion of the IP packet to determine if the packet has already been rebroadcast by that router

In Figure 2-8, for example, client C on the network connected to router B wishes to communicate with server S, which is located on the network connected to router A.

The following steps occur:

1. The client issues a name query request to NetBIOS on the host, specifying the server application by its NetBIOS name. The IP service on the host broadcasts the name query request.
2. Router B receives the name query request, determines that it is a broadcast message, and rebroadcasts it out each of its NetBIOS interfaces (except for the one on which it arrived).
3. Router A receives the broadcast request and rebroadcasts it to its local network.
4. The server on router A receives the IP broadcast request and recognizes its own name.

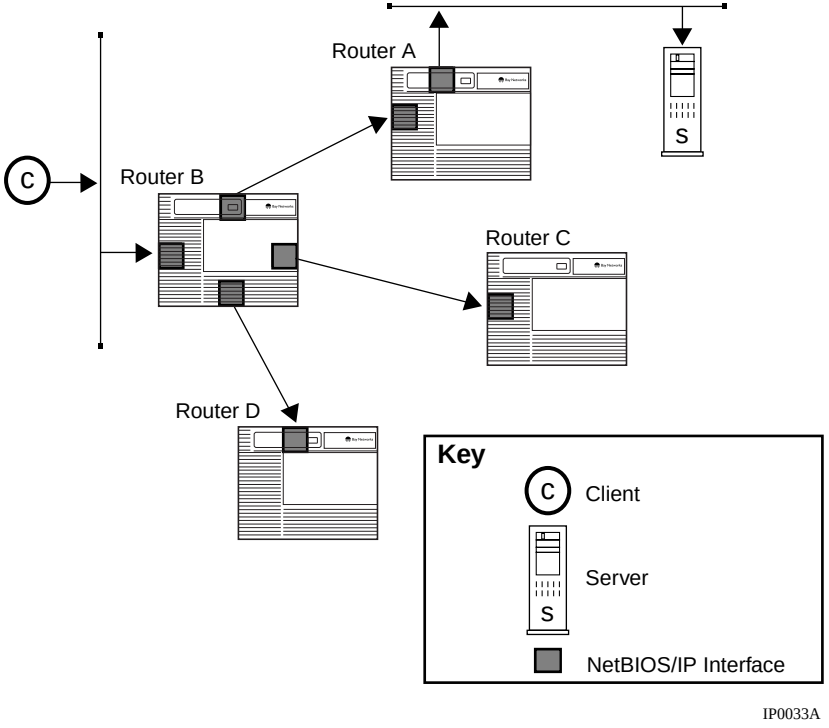

Figure 2-8. Broadcasting a Name Query Request

The server responds to the name query request by issuing a positive name query response, containing the IP address of the server, to NetBIOS on the host. The following steps occur (Figure 2-9):

1. NetBIOS sends the response to router A as a unicast message.
2. Router A and router B forward the unicast response to the awaiting client.

Now that the client has obtained the server's IP address from the name query response, client and server can communicate by exchanging IP messages.

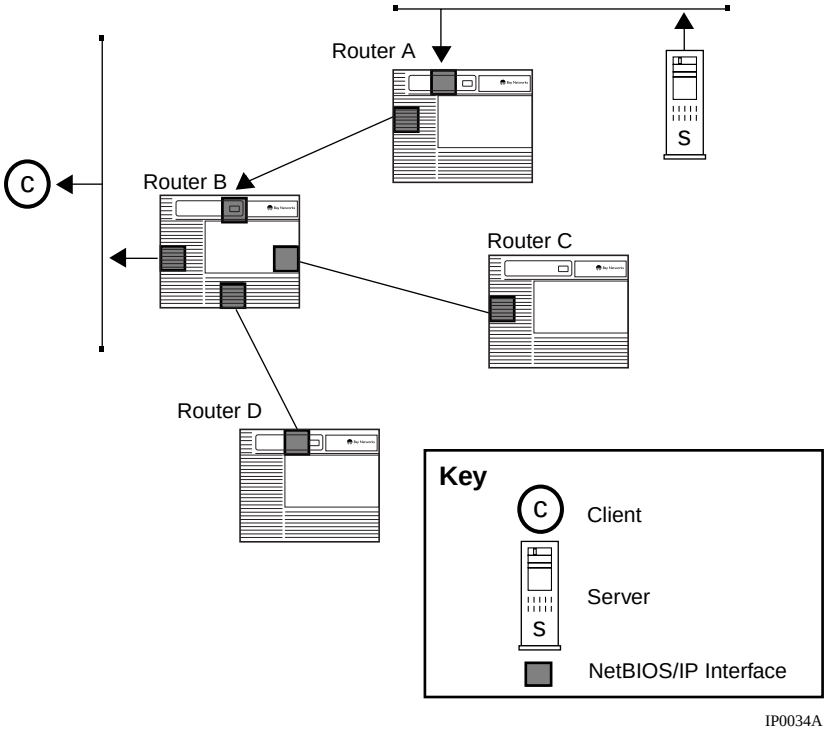

Figure 2-9. Returning a Unicast Name Query Response

Forwarding Name Queries over an Unnumbered Interface

NetBIOS cannot be configured directly on an unnumbered interface. Because of this restriction, name query requests cannot be broadcast over an unnumbered interface.

To forward name query requests over unnumbered interfaces, the network administrator configures a static NetBIOS name entry to the proper NetBIOS name server. In this way, name query requests will traverse the unnumbered interfaces as unicast IP packets.

DNS Overview

The Domain Name System (DNS) is a distributed database system, with DNS clients requesting host name/address resolution information from various DNS servers. DNS is used with numerous types of networking applications and protocols.

Specifically, DNS provides a directory service that allows client devices to retrieve information from a server-based database. For the Internet, DNS enables a device to obtain the IP address of a host based on the host's domain name.

The Nortel Networks router can function as a DNS client or as a DNS proxy server.

DNS Proxy Server

The DNS proxy server is a system solution that lets the router act as a DNS server. DNS clients can configure an IP interface on the router as their DNS server. The DNS proxy server on the router has a list of DNS servers to contact on behalf of the client.

Using the DNS proxy server feature, a network administrator can statically configure hosts to use the IP address of the DNS proxy server on the router. If the DNS servers change or physically move, the administrator has to change only the list of DNS servers on the router, rather than having to make the change on each individual client.

How the DNS Proxy Server Works

Clients on a LAN typically use DNS servers to resolve a host name to an IP address. For example, a client might request the service "www.nortelnetworks.com." Because the client cannot connect to a name service, it must translate this name to an IP address so that it can communicate over the network. DNS is the mechanism that resolves the host name to an IP address.

Clients are typically configured with a list of DNS name servers to contact to resolve host names. Due to network infrastructure changes, Internet service providers and network administrators often change the IP addresses of these statically configured name servers. When the IP addresses of these name servers change, every network client must change its local configuration for the IP address of the new name servers.

Using a DNS proxy server minimizes the work for the system administrator. Each client uses the IP address of the DNS proxy server instead of the true DNS servers. The DNS proxy server contains the list of real name servers. If the DNS servers change, only the server list on the DNS proxy server must change.

Typically, a network client has a default route specified to a local attached router. Careful network planning can allow the DNS proxy server to be the same as this default route. Setting up the DNS proxy server this way simplifies the task for a network administrator, who does not need to know the list of DNS servers when configuring new clients.

By default, the DNS proxy listens on UDP port 53 (standard DNS server port) for the IP interface on which it is configured. (You can, however, configure a different port number.) When the DNS proxy receives a valid request, it forwards the packet to the DNS server on the proxy's list. When the DNS proxy server receives a response from the DNS server, the DNS proxy forwards the packet to the requesting client and stores the response in its local cache.

The DNS proxy lets you configure timeout intervals and the number of retransmissions allowed. If the first DNS server contacted times out, the DNS proxy tries the next server on the list, and so on, until it receives a response. If all the servers time out, the DNS proxy returns a serv_fail error to the client. You can configure up to three DNS servers per proxy interface.

DNS responses can contain several answers to the client question, although most DNS clients use only the first answer in the list. Optionally, you can configure the DNS proxy to truncate the number of answers returned to the client. Any answers beyond the maximum are omitted from the DNS response message.

How the DNS Cache Works

The DNS proxy caches DNS records to improve performance, reduce network traffic, and free the real DNS server from repetitive requests. As with standard DNS, entries expire based on the time-to-live (TTL) field in the DNS record. You can configure the maximum number of cache entries. The default is 20.

When the DNS proxy receives a request, it searches its cache for the current request. If an entry exists, the DNS proxy immediately returns the answer to the client. If it does not find the entry, the DNS proxy sends a request to the real DNS server. When the response comes back from the DNS server and the TTL is greater than 0, the DNS proxy inserts the response into the cache and returns the response to the client.

Chapter 3
Customizing TCP Services

This chapter describes how to customize TCP services on the router. It assumes you have configured IP on an interface and started TCP using the default parameters, as described in Chapter 1, “Starting IP Utilities,” and that you understand the TCP concepts described in Chapter 2, “Overview of IP Utilities.”

After you start TCP on the router, TCP default values are in effect for all TCP parameters. You customize TCP by modifying these parameters as described in the following sections.

Topic	Page
Disabling and Reenabling TCP	3-2
Setting the Minimum Retransmission Timeout	3-3
Setting the Maximum Retransmission Timeout	3-4
Setting the Maximum Window Size	3-6

Disabling and Reenabling TCP

After you configure IP and start TCP, all TCP default parameters are automatically enabled on the router. If you disable TCP, it is no longer available on all IP circuits.

Using the BCC

To disable TCP, navigate to the TCP prompt and enter:

disable

For example, the following command line disables TCP on the router.

```
tcp# disable
tcp#
```

To reenable TCP, navigate to the TCP prompt and enter:

enable

For example, this command line reenables TCP on the router.

```
tcp# enable
tcp#
```

Using Site Manager

Complete the tasks in the following table to disable and reenable TCP on the router.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **TCP**.	The TCP menu opens.
4. Choose **Global**.	The Edit TCP Global Parameters window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-5.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Setting the Minimum Retransmission Timeout

You can specify a minimum value for the retransmission timeout. When one side of a TCP connection sends a frame and does not receive an acknowledgment from the other side of the connection within the timeout period, the sending station retransmits the frame.

If you are transmitting on a high-speed network and you set the minimum retransmission timeout value too high, network performance may degrade because TCP must wait for the timeout period to elapse before retransmitting unacknowledged data.

Using the BCC

By default, the router sets the minimum retransmission timeout value to 250 milliseconds (ms).

To specify a value for the minimum retransmission timeout, navigate to the TCP prompt and enter:

min-rto <*integer*>

integer is a value from 100 to 15,000 milliseconds (ms).

For example, the following command sets the value for the minimum retransmission timeout to 300 ms:

```
tcp# min-rto 300
tcp#
```

Note: When specifying a minimum retransmission timeout value, do not use a comma in the value.

Using Site Manager

Complete the tasks in the following table to specify a value for the minimum retransmission timeout.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **TCP**.	The TCP menu opens.
4. Choose **Global**.	The Edit TCP Global Parameters window opens.
5. Set the **Min. Retransmission Timeout (msec.)** parameter. Click on **Help** or see the parameter description on page A-3.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Setting the Maximum Retransmission Timeout

You can specify a maximum value for the retransmission timeout. When one side of a TCP connection sends a frame and does not receive an acknowledgment from the other side of the connection within the timeout period, the sending station retransmits the frame.

If you are transmitting on a low-speed network and you set the maximum retransmission timeout value too low, the network may become congested, as TCP retransmits unacknowledged frames that have not yet reached their destination.

Using the BCC

By default, TCP sets the maximum retransmission value to 240,000 ms. To specify a value for the minimum retransmission timeout, navigate to the TCP prompt and enter:

max-rto <*integer*>

integer is a value from 15,000 to 240,000 ms.

For example, the following command sets the value for the maximum retransmission timeout to 235,000 ms:

```
tcp# max-rto 235000
tcp#
```

Note: When specifying a maximum retransmission timeout value, do not use a comma in the value.

Using Site Manager

Complete the tasks in the following table to specify a maximum value for the retransmission timeout.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **TCP**.	The TCP menu opens.
4. Choose **Global**.	The Edit TCP Global Parameters window opens.
5. Set the **Max. Retransmission Timeout (msec.)** parameter. Click on **Help** or see the parameter description on page A-4.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Setting the Maximum Window Size

You can specify a value in bytes to determine the maximum transmit-and-receive window size that TCP allows for each connection. The larger the window size, the more memory each TCP connection consumes.

Using the BCC

By default, TCP sets the maximum window size to 4096 bytes. To specify the maximum window size, navigate to the TCP prompt and enter:

max-win *<integer>*

integer is a value from 512 to 65,535 bytes.

For example, the following command sets the value for the maximum window size to 1050 bytes:

```
tcp# max-win 1050
tcp#
```

Note: When specifying a maximum window size, do not use a comma in the value.

Using Site Manager

Complete the tasks in the following table to set the maximum window size (in bytes) that TCP allows for each connection.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Edit TCP Global Parameters window opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **TCP**.	The TCP menu opens.
4. Choose **Global**.	The Edit TCP Global Parameters window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Set the **Max. Window Size (bytes)** parameter. Click on **Help** or see the parameter description on page A-4.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Chapter 4
Customizing FTP Services

This chapter describes how to customize FTP services on the router. It assumes you have configured IP on an interface and started FTP using the default parameters, as described in Chapter 1, “Starting IP Utilities, and that you understand the FTP concepts described in Chapter 2, “Overview of IP Utilities.”

After you start FTP on the router, FTP default values are in effect for all FTP parameters. You customize FTP by modifying these parameters as described in the following sections.

Topic	Page
Configuring FTP Using the BCC or Site Manager	4-2
Disabling and Reenabling FTP	4-2
Specifying the FTP Default Volume	4-3
Specifying the Number of Login Retries	4-5
Specifying the Maximum FTP Idle Timeout	4-6
Specifying the Maximum Number of FTP Sessions	4-7
Specifying the Data Transmission Type	4-8
Specifying the FTP Control Connection	4-8
Specifying a Data Transfer Value	4-9
Specifying the TCP Window Size	4-10

Configuring FTP Using the BCC or Site Manager

Table 4-1 lists the FTP configuration tasks described in this chapter and indicates whether you can use the BCC or Site Manager to perform each task.

Table 4-1. FTP Configuration Tasks

Task	BCC	Site Manager
Disabling and Reenabling FTP	✓	✓
Specifying the FTP Default Volume	✓	✓
Specifying the Number of Login Retries	✓	✓
Specifying the Maximum FTP Idle Timeout	✓	✓
Specifying the Maximum Number of FTP Sessions	✓	✓
Specifying the Data Transmission Type		✓
Specifying the FTP Control Connection		✓
Specifying a Data Transfer Value		✓
Specifying the TCP Window Size	✓	✓

Disabling and Reenabling FTP

After you configure IP and start FTP, all FTP default values are automatically enabled on the router.

Using the BCC

To disable FTP, navigate to the FTP prompt and enter:

disable

For example, this command line disables the FTP server on the router.

```
ftp# disable
ftp#
```

To reenable FTP, navigate to the FTP prompt and enter:

enable

For example, the following command line reenables FTP on the router.

```
ftp# enable
ftp#
```

Using Site Manager

Complete the tasks in the following table to enable and disable an FTP server.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-5.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the FTP Default Volume

The FTP default volume is the file system volume to which FTP writes transferred files and from which FTP retrieves files for transfer. By default, the FTP default volume is 2 on the BN® router and 1 on the BayStack™ router. If you are configuring an AN® router, you must specify volume 1.

Using the BCC

To specify the FTP default volume, navigate to the FTP prompt and enter:

default-volume <*volume_number*>

volume _number is an integer from 1 through 14, 1a through 4a, or 1b through 4b.

For example, the following command sequence specifies volume 5 as the default volume and displays attributes and values:

```
ftp# default-volume 5
ftp# info
   default-volume 5
   login-retries 3
   idle-timeout 900
   max-sessions 3
   tcp-window-size 60000
   state disabled
ftp#
```

Using Site Manager

Complete the tasks in the following table to specify the FTP default volume.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols.**	The Protocols menu opens.
2. Choose **Global Protocols.**	The Global Protocols menu opens.
3. Choose **FTP.**	The FTP menu opens.
4. Choose **Global.**	The Edit FTP Global Parameters window opens.
5. Set the **Default Volume** parameter. Click on **Help** or see the parameter description on page A-5.	
6. Click on **OK.**	Site Manager saves your changes and exits the window.

Specifying the Number of Login Retries

The FTP login retries value is the number of FTP login retries that FTP will accept before rejecting logins.

Using the BCC

By default, FTP accepts only three FTP login retries. To change the number of retries, navigate to the FTP prompt and enter:

login-retries <*integer*>

integer is the number of retries that FTP allows.

For example, the following command line causes FTP to accept 10 login retries before rejecting logins:

```
ftp# login-retries 10
ftp#
```

Using Site Manager

Complete the tasks in the following table to specify an FTP login retry value.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Login Retries** parameter. Click on **Help** or see the parameter description on page A-5.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the Maximum FTP Idle Timeout

The FTP idle time is the length of time (in seconds) that FTP waits before closing an idle FTP control connection. You must determine the maximum idle time you want to allow and specify the time value in seconds.

Using the BCC

By default, FTP waits 900 seconds before closing an idle FTP control connection. To specify a timeout interval, navigate to the FTP prompt and enter:

idle-timeout <*integer*>

integer is the number of seconds FTP waits before timing out.

For example, the following command line causes FTP to wait 150 seconds before closing an idle FTP control session:

```
ftp# idle-timeout 150
ftp#
```

Using Site Manager

Complete the tasks in the following table to set the length of time (in seconds) that FTP waits before closing an idle FTP control connection.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Idle Time Out (secs)** parameter. Click on **Help** or see the parameter description on page A-6.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the Maximum Number of FTP Sessions

You can determine the maximum number of FTP sessions you want to run simultaneously by specifying a value from 1 to 10000.

Using the BCC

By default, FTP allows up to three sessions at one time. To specify the number of sessions, navigate to the FTP prompt and enter:

max-sessions <*integer*>

integer is the maximum number of allowable FTP sessions.

For example, the following command sets the maximum number of FTP sessions to 10:

```
ftp# max-session 10
ftp#
```

Using Site Manager

Complete the tasks in the following table to specify the maximum number of FTP sessions you want to run at one time.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Max. Sessions** parameter. Click on **Help** or see the parameter description on page A-6.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the Data Transmission Type

You can determine the type of data transmission you want to use to transfer your files. To tranfer files consisting of ASCII characters, specify ASCII. To specify files consisting of binary characters, specify Binary.

You can use Site Manager to specify the data transmission type you want to use.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, select **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Type of Service** parameter. Click on **Help** or see the parameter description on page A-6.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the FTP Control Connection

You can determine how the Internet transport layer handles datagrams on a control data connection by specifying the Type of Service value that FTP inserts in IP datagrams on a control connection.

You can use Site Manager to specify the type of service value.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Control Connection** parameter. Click on **Help** or see the parameter description on page A-7.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying a Data Transfer Value

You can determine how the Internet transport layer handles datagrams on a data transfer connection by specifying a value that indicates the Type of Service that FTP inserts in IP datagrams on a data transfer connection.

You can use Site Manager to specify the type of service value that FTP inserts in IP datagrams on a data transfer connection.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, select **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **Data Transfer** parameter. Click on **Help** or see the parameter description on page A-7.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the TCP Window Size

You can determine the size of the window you require on your system for TCP connections by specifying its size in bytes.

Using the BCC

By default, the size of TCP windows used for connections is 60,000 bytes. To specify a TCP window size, navigate to the FTP prompt and enter:

tcp-window-size <*integer*>

integer is the size in bytes of the TCP window.

For example, the following command line sets the window size used for TCP connections to 45,000 bytes:

```
ftp# tcp-window-size 45000
ftp#
```

Using Site Manager

Complete the tasks in the following table to specify the size of the windows used for TCP connections.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **FTP**.	The FTP menu opens.
4. Choose **Global**.	The Edit FTP Global Parameters window opens.
5. Set the **TCP Window Size** parameter. Click on **Help** or see the parameter description on page A-7.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Chapter 5
Customizing TFTP Services

This chapter describes how to customize Trivial File Transfer Protocol (TFTP) services on the router. It assumes that you configured IP on an interface and started TFTP using the default parameters, as described in Chapter 1, “Starting IP Utilities,” and that you understand the TFTP concepts described in Chapter 2, “Overview of IP Utilities.”

After you start TFTP on the router, TFTP default values are in effect for all TFTP parameters. You customize TFTP by modifying these parameters as described in the following sections.

Topic	Page
Disabling and Reenabling TFTP Services	5-2
Specifying the Default Volume for the Router	5-3
Specifying a Retry Timeout Value	5-4
Specifying a Close Timeout Value	5-5
Specifying the Number of Retransmissions	5-6
Deleting TFTP from the Router	5-7

Disabling and Reenabling TFTP Services

After you configure IP and start TFTP on the router, TFTP is enabled on the router. You can disable and reenable TFTP using the BCC or Site Manager.

Using the BCC

To disable TFTP, navigate to the TFTP prompt and enter:

disable

For example, the following command disables TFTP on the router:

```
tftp# disable
tftp#
```

To reenable TFTP, navigate to the TFTP prompt and enter:

enable

For example, the following command reenables TFTP on the router:

```
tftp# enable
tftp#
```

Using Site Manager

To disable and reenable TFTP services, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	The TFTP menu opens.
4. Choose **Edit TFTP Parameters**.	The Edit TFTP Parameters window opens.
5. Set the **Enable** parameter. Click on **Help** or see the parameter description on page A-8.	
6. Click on **OK**.	You return to the Configuration Manager window.

Specifying the Default Volume for the Router

When you configure TFTP on the router, you can specify which of the router slots will be used for all TFTP GET and PUT commands. By default, the slot on which TFTP runs is slot 2 on the BN router and slot 1 on the BayStack router. If you are configuring an AN router, you must specify slot 1.

Using the BCC

To specify the volume (slot) on which TFTP runs, navigate to the TFTP prompt and enter:

default-volume <*slot*>

slot is an integer from 1 through 14, 1a through 4a, or 1b through 4b.

For example, the following command sets the default volume on which TFTP runs to 3:

```
tftp# default-volume 3
tftp#
```

Using Site Manager

To specify the appropriate volume number (slot) on which to run TFTP, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	The TFTP menu window opens.
4. Choose **Edit TFTP Parameters**.	The Edit TFTP Parameters window opens.
5. Set the **Default Volume** parameter. Click on **Help** or see the parameter description on page A-8.	
6. Click on **OK**.	You return to the Configuration Manager window.

Specifying a Retry Timeout Value

You can specify the amount of time (in seconds) that TFTP waits for an acknowledgment before retransmitting the last packet.

By default, TFTP waits 5 seconds for an acknowledgment before retransmitting the last packet.

Using the BCC

To specify a retry timeout value, navigate to the TFTP prompt and enter:

retry-timeout <*integer*>

integer is any number of seconds.

For example, the following command causes TFTP to wait 10 seconds before it retransmits the last packet:

```
tftp# retry-timeout 10
tftp#
```

Using Site Manager

To specify the number of seconds that TFTP waits for an acknowledgment, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	The TFTP menu opens.
4. Choose **Edit TFTP Parameters**.	The Edit TFTP Parameters window opens.
5. Set the **Retry Time Out** parameter. Click on **Help** or see the parameter description on page A-8.	
6. Click on **OK**.	You return to the Configuration Manager window.

Specifying a Close Timeout Value

You can specify the number of seconds that TFTP waits, after it has successfully retrieved a file, to make sure that the sender has received the last acknowledgment. By default, TFTP waits 25 seconds.

Using the BCC

To specify a close timeout value, navigate to the TFTP prompt and enter:

close-timeout <*integer*>

integer is any number of seconds.

For example, the following command causes TFTP to wait 15 seconds to make sure that the sender has received the last acknowledgment:

```
tftp# close-timeout 15
tftp#
```

Using Site Manager

To specify a close timeout value, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	The TFTP menu opens.
4. Choose **Edit TFTP Parameters**.	The Edit TFTP Parameters window opens.
5. Set the **Close Time Out** parameter. Click on **Help** or see the parameter description on page A-9.	
6. Click on **OK**.	You return to the Configuration Manager window.

Specifying the Number of Retransmissions

You can specify the number of times that TFTP retransmits an unacknowledged message before abandoning the transfer attempt. By default, TFTP abandons the transfer attempt after five unsuccessful retransmissions.

Using the BCC

To specify the number of times that TFTP retransmits an unacknowledged message before aborting, navigate to the TFTP prompt and enter:

retry-count *<integer>*

integer indicates any number of retransmissions.

For example, the following command causes TFTP to abandon a transfer attempt after 10 retries:

```
tftp# retry-count 10
tftp#
```

Using Site Manager

To specify the number of retransmissions that TFTP will attempt, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	The TFTP menu opens.
4. Choose **Edit TFTP Parameters**.	The Edit TFTP Parameters window opens.
5. Set the **Retransmit** parameter. Click on **Help** or see the parameter description on page A-9.	
6. Click on **OK**.	You return to the Configuration Manager window.

Deleting TFTP from the Router

You can use the BCC or Site Manager to delete TFTP from the router.

Using the BCC

To delete TFTP from the router, navigate to the TFTP prompt and enter:

delete

Using Site Manager

To delete TFTP from the router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **TFTP**.	The TFTP menu opens.
4. Choose **Delete**.	You return to the Configuration Manager window.

Chapter 6
Customizing Telnet Services

This chapter describes how to customize Telnet services on the router. It assumes you have configured IP on an interface and started Telnet using the default parameters, as described in Chapter 1, “Starting IP Utilities,” and that you understand the Telnet concepts described in Chapter 2, “Overview of IP Utilities.”

After you start Telnet services on the router, default values are in effect for all Telnet configuration parameters. You may want to change these parameter values, depending on the requirements of your network.

Topic	Page
Configuring Telnet Using the BCC or Site Manager	6-2
Customizing the Telnet Configuration	6-3
Customizing the Telnet Server on the Router	6-6
Customizing a Telnet Client on the Router	6-20

Configuring Telnet Using the BCC or Site Manager

Table 6-1 lists the Telnet configuration tasks described in this chapter and indicates whether you can use the BCC or Site Manager to perform each task.

Table 6-1. Telnet Configuration Tasks

Task	BCC	Site Manager
Changing the Name of the Manager's Login Script File	✓	✓
Changing the Name of the User's Login Script File	✓	✓
Enabling and Disabling User Logout	✓	✓
Disabling and Reenabling a Telnet Server on the IP Router	✓	✓
Specifying the Maximum Number of Lines on the Console	✓	✓
Pausing Telnet Console Output	✓	✓
Changing the Telnet Login Prompt	✓	✓
Changing the Login Timeout	✓	✓
Changing the Password Timeout	✓	✓
Changing the Command Timeout	✓	✓
Changing Login Retries	✓	✓
Using Telnet Server Diagnostics		✓
Changing the History File	✓	✓
Disabling and Reenabling a Telnet Client on the IP Router	✓	✓
Enabling and Disabling Verbose Debug Logging	✓	✓
Changing the Remote Port	✓	✓
Changing the Command Prompt	✓	✓

Customizing the Telnet Configuration

After you start the Telnet server to establish inbound Telnet sessions on the router, the script files for the Manager's Login, User's Login, and Force User's Login run automatically when you log in. You can accept these defaults or customize the Telnet configuration by changing these scripts as needed.

Changing the Name of the Manager's Login Script File

By default, the name of the manager's script file is *automgr.bat*. You can specify a new name for the manager's login script by supplying an 8-character file name. If you do not want to change the name of the manager's login script, accept the default name.

Using the BCC

To specify the name of the Manager's Login script, navigate to the server-specific prompt and enter:

manager-script <*string*>

string is the name of the manager's login script file.

For example, the following command line causes the device to assign the name *manager1.bat* to the manager's login script:

```
server# manager-script manager1.bat
server#
```

Using Site Manager

Complete the tasks in the following table to specify a new manager's login script file.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Configuration window opens.
5. Set the **Manager's Login Script** parameter. Click on **Help** or see the parameter description on page A-14.	
6. Click on **OK**.	Site Manager saves your changes, exits the window, and returns you to the Configuration Manager window.

Changing the Name of the User's Login Script File

By default, the name of the user's login script file is *autouser.bat*. You can specify a new name for the user's login script file by supplying an 8-character file name. If you do not want to change the name of the user's login script, accept the default name.

Using the BCC

To specify the name of the user's login script file, navigate to the server-specific prompt and enter:

auto-user-script <*string*>

string is the name of the user's login script file.

For example, the following command line causes the system to automatically execute the script file *router1.bat* at login:

```
server# auto-user-script router1.bat
server#
```

Using Site Manager

Complete the tasks in the following table to specify a new user's login script file.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Configuration window opens.
5. Set the **User's Login Script** parameter. Click on **Help** or see the parameter description on page A-14.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Enabling and Disabling User Logout

By default, the user autoscript is in effect for your Telnet session when you log in. You can press control-c to cancel the user autoscript and access the Technician Interface. To prevent users from canceling the user autoscript at login, set this parameter to Enable.

Using the BCC

To prevent users from canceling the user autoscript at login, navigate to the server-specific prompt and enter:

force-logout enabled

For example, this command line prevents users from canceling the user autoscript at login:

```
server# force-logout enabled
server#
```

To allow users to cancel the user autoscript at login, navigate to the server-specific prompt and enter:

force-logout disabled

For example, this command line allows users to cancel the user autoscript at login:

```
server# force-logout disabled
server#
```

Using Site Manager

Complete the tasks in the following table to cancel the user autoscript at login or to prevent users from canceling the user autoscript at login.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Configuration window opens.
5. Set the **Force User Logout** parameter. Click on **Help** or see the parameter description on page A-15.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Customizing the Telnet Server on the Router

This section describes how to customize your Telnet server on the router.

Disabling and Reenabling a Telnet Server on the IP Router

You can enable or disable a Telnet server on the IP router. By default, Telnet is enabled for the IP router, allowing you to establish Telnet sessions to the target router.

Using the BCC

By default, the Telnet server is enabled on the IP router. To disable a Telnet server, navigate to the Telnet server prompt and enter:

disable

For example:

```
telnet# server
server# disable
```

To reenable a Telnet server on the IP router, navigate to the Telnet server prompt and enter:

enable

For example:

```
telnet# server
server# enable
```

Using Site Manager

Complete the tasks in the following table to enable or disable a Telnet server on an IP router.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server.**	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-16.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Specifying the Maximum Number of Lines on the Console

You can specify the maximum number of lines displayed on the Telnet console screen. The screen may override the number of lines you specify if Telnet can negotiate the window size with the remote client. Make sure that the number that you set is in accordance with your console requirements.

Using the BCC

By default, the maximum number of lines displayed on the Telnet screen is 24. To specify the maximum number of lines displayed on the Telnet screen, enter:

lines <*integer*>

integer is the maximum number of lines that the console screen can display.

For example, the following command line sets the maximum number of lines displayed on a Telnet console screen to 50:

```
server# lines 50
server#
```

Using Site Manager

Complete the tasks in the following table to specify the maximum number of lines displayed on a Telnet console screen.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **TI Lines per Screen** parameter. Click on **Help** or see the parameter description on page A-10.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Pausing Telnet Console Output

By default, Telnet console output pauses after each screen fills with data. You can configure Telnet not to pause after each screen fills with data by disabling this feature.

Using the BCC

To configure the Telnet console output to pause, navigate to the Telnet-specific prompt and enter:

more

For example, the following command line prevents Telnet console output from pausing:

```
server# more disabled
server#
```

Using Site Manager

Complete the tasks in the following table to specify whether to pause Telnet console output.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **TI More** parameter. Click on **Help** or see the parameter description on page A-10.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Changing the Telnet Login Prompt

You can change the Telnet login prompt on the Telnet console screen by specifying a character string from 1 through 18 alphanumeric characters.

Using the BCC

To change the Telnet login prompt on the Telnet console screen, navigate to the server-specific prompt and enter:

prompt <*string*>

string is any text string from 1 to 18 characters.

For example, the following command line changes the Telnet login prompt to *rtr1:*

```
server# prompt rtr1
server#
```

Using Site Manager

Complete the tasks in the following table to change the Telnet login prompt on the Telnet console screen.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **TI Prompt** parameter. Click on **Help** or see the parameter description on page A-11.	
6. Click on **OK**.	Disconnects the current Telnet session.

Changing the Login Timeout

You can specify a value that will determine the number of minutes that can elapse before the device disconnects the Telnet session if you fail to enter a login ID at the login prompt.

Using the BCC

By default, the device waits 1 minute before it disconnects the Telnet session if you fail to enter a login ID at the login prompt. To specify the number of minutes that can elapse before the device disconnects the Telnet session if you fail to enter a login ID at the login prompt, navigate to the server-specific prompt and enter:

login-timeout

For example, the following command line causes the device to wait 15 minutes before it disconnects the Telnet session if you fail to enter a login ID at the login prompt:

```
server# login-timeout 15
server#
```

Using Site Manager

Complete the tasks in the following table to specify the number of minutes that can elapse before the device disconnects the Telnet session.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server.**	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Login Timeout (min.)** parameter. Click on **Help** or see the parameter description on page A-11.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Changing the Password Timeout

By changing the password timeout value you can determine the number of minutes that can elapse before the device disconnects the Telnet session if you do not enter a password at the password prompt.

Using the BCC

By default, the device waits 1 minute before it disconnects the Telnet session if you fail to enter a password at the password prompt. To specify the number of minutes that can elapse before the device disconnects the Telnet session, navigate to the server-specific prompt and enter:

password-timeout <*integer*>

integer is a number from 1 to 99.

For example, the following command causes the device to wait 20 minutes before it disconnects the Telnet session:

```
server# password-timeout 20
server#
```

Using Site Manager

Complete the tasks in the following table to specify the number of minutes that can elapse before the device disconnects the Telnet session if you fail to enter a password.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Serve**r.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Set the **Password Timeout (min.)** parameter. Click on **Help** or see the parameter description on page A-11.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Changing the Command Timeout

By changing the command timeout you determine the number of minutes that can elapse before the Technician Interface disconnects the Telnet session if you do not enter a command at the command prompt.

Using the BCC

By default, the device waits 15 minutes before it disconnects the Telnet session if you fail to enter a command at the command prompt. To specify the number of minutes that the device will wait before it disconnects the Telnet session, navigate to the server-specific prompt and enter:

command-timeout <*integer*>

integer is a number from 1 to 99.

For example, the following command line causes the device to wait 35 minutes before it disconnects the Telnet session if you fail to enter a command at the command prompt:

```
server# command-timeout 35
server#
```

Using Site Manager

Complete the tasks in the following table to specify the number of minutes that can elapse before the device disconnects the Telnet session if you fail to enter a command.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Command Timeout (min.)** parameter. Click on **Help** or see the parameter description on page A-12.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Changing Login Retries

By changing the login retries you can determine the maximum number of login attempts allowed before the device disconnects the Telnet session.

Using the BCC

By default, the device allows you 3 login attempts before it disconnects the Telnet session. To change the maximum number of allowed login attempts, enter:

login-retries <*integer*>

integer is a number from 1 to 99 login attempts.

For example, the following command line tells the device to allow 10 attempts before it disconnects the Telnet session:

```
server# login-retries 10
server#
```

Using Site Manager

Complete the tasks in the following table to specify the number of login attempts allowed before the device disconnects the Telnet session.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Login Retries** parameter. Click on **Help** or see the parameter description on page A-12.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Using Telnet Server Diagnostics

This section describes how to configure Telnet server diagnostic parameters to customize the way the Technician Interface performs diagnostics on a router. Field Service personnel use these features to troubleshoot problems.

The BCC does not support these functions.

Enabling Diagnostic Reporting

This parameter allows field personnel to specify whether the Technician Interface displays a report that shows a record of all processing operations. By default, recording of processing operations is disabled.

To enable the Technician Interface to display a report showing a record of all processing operations, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Diagnostic Report** parameter. Click on **Help** or see the parameter description on page A-12.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Enabling Diagnostic Exercise

This parameter allows field personnel to enable exercise diagnostics on the Telnet server.

To enable exercise diagnostics on the Telnet server, complete the tasks in the following table:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Set the **Diagnostic Exercise** parameter. Click on **Help** or see the parameter description on page A-13.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Enabling Diagnostic Network Data

This parameter allows you to specify whether you want the Technician Interface to display Telnet protocol information. It is used for diagnostic purposes only by field service personnel.

To display Telnet protocol information, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global.**	The Telnet Server Global Parameters window opens.
5. Set the **Diagnostic Network Data** parameter. Click on **Help** or see the parameter description on page A-13.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Enabling Diagnostic PTY Data

To specify whether you want the Technician Interface to display pseudo-terminal driver (PTY) information, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Diagnostic PTY Data** parameter. Click on **Help** or see the parameter description on page A-13.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Enabling Diagnostic Options

To specify whether you want the Technician Interface to display information on Telnet diagnostic options, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **Diagnostic Options** parameter. Click on **Help** or see the parameter description on page A-14.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Changing the History File

You can determine the maximum number of commands you want stored in the local command history table. The table stores each command you enter at the device prompt, on a first-in, first-out (FIFO) basis.

Using the BCC

By default, the number of commands that the router stores in the local command history table is 20. To set the maximum number of commands that you want the router to store in the history table, navigate to the server prompt and enter:

hist <*integer*>

integer is a number from 1 to 40.

For example, the following command line sets the maximum number of commands that the router stores in the history table to 35:

```
server# hist 35
server#
```

Using Site Manager

Complete the tasks in the following table to specify the number of commands that the router stores in the history table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Server**.	The Telnet Server menu opens.
4. Choose **Global**.	The Telnet Server Global Parameters window opens.
5. Set the **TI History Depth** parameter. Click on **Help** or see the parameter description on page A-15.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Customizing a Telnet Client on the Router

After you start a Telnet client on the router for outbound Telnet sessions, as described in Chapter 1, default values are in effect for all Telnet client parameters. You may want to change these parameter values, depending on the requirements of your network.

The following sections describe information you supply and options you select that affect the way a Telnet client runs on the router.

Disabling and Reenabling a Telnet Client on the IP Router

You can disable or reenable a Telnet client on the IP router. By default, the Telnet client is enabled on the IP router, allowing you to establish Telnet sessions to the target router.

Using the BCC

To disable a Telnet client, navigate to the client-specific prompt and enter:

disable

For example, the following command line disables a Telnet client:

```
client# disable
client#
```

To reenable a Telnet client on the IP router and display its default values, navigate to the client-specific prompt and enter:

enable

For example, the following command line reenables a Telnet client:

```
client# enable
client# info
   debug-log-flag off
   remote-port 23
   prompt {}
   state enabled
```

Using Site Manager

Complete the tasks in the following table to enable or disable a Telnet client on an IP router.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Client.**	The Telnet Client menu opens.
4. Choose **Global**.	The Telnet Client Global Parameters window opens.
5. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-9.	
6. Click on **OK**.	Site Manager saves your changes and exits the window.

Enabling and Disabling Verbose Debug Logging

You can specify whether you want to enable or disable verbose debug logging. When you enable verbose debug logging, you tell the device to display the negotiation process between the Telnet server and Telnet client. This parameter is for diagnostic use only.

Using the BCC

By default, verbose debug logging is turned off (disabled). To enable verbose debug logging, navigate to the client-specific prompt and enter:

debug-log-flag on

For example, the following command line enables verbose debug logging:

```
client# debug-log-flag on
client#
```

To disable verbose debug logging, navigate to the client-specific prompt and enter:

```
client# debug-log-flag off
client#
```

Site Manager

To enable and disable verbose debug logging, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Client**.	The Telnet Client menu opens.
4. Choose **Global**.	The Edit Telnet Client Global Parameters window opens.
5. Set the **Verbose Debug Logging** parameter. Click on **Help** or see the parameter description on page A-16.	
6. Click on **OK**.	You return to the Configuration Manager window.

Changing the Remote Port

You can change the default remote Telnet server's TCP remote port by specifying a valid TCP port number.

Using the BCC

By default, the Telnet server's TCP remote port is 23. To change the remote port, navigate to the client-specific prompt and enter:

remote-port <*integer*>

integer is any valid TCP port number.

For example, the following command line changes the Telnet server's TCP remote port number to 20:

```
client# remote-port 20
client#
```

Using Site Manager

To change the remote Telnet server's TCP port, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Client**.	The Telnet Client menu opens.
4. Choose **Global**.	The Edit Telnet Client Global Parameters window opens.
5. Set the **Remote Port** parameter. Click on **Help** or see the parameter description on page A-17.	
6. Click on **OK**.	You return to the Configuration Manager window.

Changing the Command Prompt

You can change the default Telnet client command prompt by specifying any text string less than 40 characters long.

Using the BCC

To change the default Telnet client command prompt, navigate to the client-specific prompt and enter:

prompt *<string>*

string is any text string less than 40 characters.

For example, the following command line changes the default command prompt to *system1*:

```
client# prompt system1
client#
```

Using Site Manager

To change the default Telnet client command prompt, complete the tasks in the following table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **Telnet Client**.	The Telnet Client menu opens.
4. Choose **Global**.	The Edit Telnet Client Global Parameters window opens.
5. Set the **Prompt** parameter. Click on **Help** or see the parameter description on page A-17.	
6. Click on **OK**.	You return to the Configuration Manager window.

Chapter 7
Customizing NTP Services

This chapter describes how to customize NTP services on the router. It assumes you have configured IP on an interface and started NTP using the default parameters, as described in Chapter 1, “Starting IP Utilities,” and that you understand the NTP concepts described in Chapter 2, “Overview of IP Utilities.”

After you start NTP on the router, NTP default values are in effect for all NTP parameters. You customize NTP by modifying these parameters as described in the following sections.

Topic	Page
Configuring NTP Using the BCC or Site Manager	7-2
Disabling and Reenabling NTP	7-2
Setting the NTP Operation Mode	7-3
Configuring Remote Time Servers	7-5
Configuring NTP Access Control	7-13

Configuring NTP Using the BCC or Site Manager

Table 7-1 lists the NTP configuration tasks described in this chapter and indicates whether you can use the BCC or Site Manager to perform each task.

Table 7-1. NTP Configuration Tasks

Task	BCC	Site Manager
Disabling and Reenabling NTP	✓	✓
Setting the NTP Operation Mode		✓
Adding Remote Time Servers	✓	✓
Setting the Mode for a Remote Time Server	✓	✓
Setting Local Host Mode		✓
Specifying the Source IP Address	✓	✓
Specifying Peer Preference		✓
Deleting Remote Time Servers from a Router	✓	✓
Configuring NTP Access Control		✓

Disabling and Reenabling NTP

By default, NTP is enabled when you start it on the router. You can disable and reenable NTP at any time.

Using the BCC

To disable NTP services, navigate to the NTP prompt and enter:

disable

For example, the following command line disables NTP on the router:

```
ntp# disable
ntp#
```

To reenable NTP services, navigate to the NTP prompt and enter:

enable

For example, the following command line reenables NTP on the router:

```
ntp# enable
ntp#
```

Using Site Manager

To disable and reenable NTP on the router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Global**.	The Edit NTP Global Parameters window opens.
5. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-3.	
6. Click on **OK**.	You return to the Configuration Manager window.

Setting the NTP Operation Mode

You must specify the mode of operation in which you want to configure NTP to run on a router. NTP provides three operation modes: unicast client, broadcast client, and multicast client modes. The current implementation of NTP supports only client mode.

You select unicast client mode when you want to configure remote time servers (peers). You select broadcast client mode and multicast client mode when you want to configure access control filters to restrict certain remote time servers from sending NTP packets to a local NTP client.

By default, NTP runs in unicast client mode.

To specify the mode in which you want NTP to run on the router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose Protocols**.**	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Global**.	The Edit NTP Global Parameters window opens.
5. Set the **Mode** parameter. Click on **Help** or see the parameter description on page A-18.	
6. Click on **OK**.	You return to the Configuration Manager window.

Configuring Remote Time Servers

You configure remote time servers (peers) for time synchronization in unicast client mode only. Configuring a remote time server involves:

- Adding remote time servers
- Specifying the configuration peer mode for the time server
- Setting the mode of operation of the router
- Specifying a source IP address for the time server
- Specifying peer preference
- Deleting peers

Adding Remote Time Servers

You add remote time servers to the router by specifying the IP address of each time server (peer). NTP adds the IP address of the time server to a peer list, which the local NTP client uses when querying remote time servers for time information.

NTP queries all the remote time servers in the peer list for time information and then determines which time server to synchronize its internal clock to based on the following criteria:

- Lowest stratum
- Closest in proximity to the primary time server
- Claimed highest precision

When the local NTP client queries the remote time servers from the peer list, the servers respond with various timestamps, along with information about their clocks, such as stratum, precision, and time reference. The local NTP client reviews a list of responses from all the available servers and chooses one server as the “best” time source from which to synchronize its internal clock.

Nortel Networks recommends that you configure a minimum of three upper stratum remote time servers (peers) for a router, because it can apply an agreement algorithm to detect a problem on any part of the time source. You can, if necessary, add a maximum of five remote time servers on a device (a router, for example). Configuring multiple remote time servers ensures redundancy in case one peer fails.

Using the BCC

To specify the IP address of each peer that you want to add to the router, navigate to the NTP prompt and enter:

peer <*address*>

address is 0.0.0.0 or any valid IP address.

For example, the following command line adds the peer 2.2.2.2 to the router:

```
ntp# peer 2.2.2.2
peer/2.2.2.2#
```

Using Site Manager

To specify the IP address of each NTP time server that you want to add, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Peers**.	The NTP Peers Configuration List window opens.
5. Click on **Add**.	The NTP Peer Configuration window opens.
6. Set the **Peer IP address** parameter. Click on **Help** or see the parameter descriptions on page A-18.	
7. Click on **OK**.	The NTP Peer Configuration List window opens, displaying the IP address of the time server that you configured and the default NTP peer configuration parameter values.

Setting the Mode for a Remote Time Server

You can specify the mode in which a remote time server operates on the network. However, because NTP operates locally in client mode only, all remote time servers known to the local NTP client are servers.

By default, the mode is set to server, indicating that the local NTP client adjusts its clock to the given remote time server but does not attempt to adjust the time server's clock. You should accept the default value.

Using the BCC

To specify the mode in which a remote time server operates, enter:

mode <*mode_type*>

mode_type is either server or peer.

For example, the following command line sets the mode in which the remote server 3.3.3.3 will operate to server:

```
peer/3.3.3.3# mode server
peer/3.3.3.3# info
   address 3.3.3.3
   mode server
   src-ip-address 0.0.0.0
```

Using Site Manager

To specify the mode for the remote time server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Peers**.	The NTP Peers Configuration List window opens.
5. Click on the IP address of the time server in the NTP Peer list.	

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
6. Set the **Config Peer Mode** parameter. Click on **Help** or see the parameter descriptions on page A-19.	
7. Click on **Apply**.	Site Manager sets the mode for the remote time server to Server. Nortel Networks supports only the Server option.
8. Click on **Done**.	You return to the Configuration Manager window.

Setting Local Host Mode

Local Host Mode indicates the mode of operation of the local NTP client. By default, the Local Host Mode is set to client, because only unicast client mode is supported.

To specify the local mode in which you want to configure the local NTP client, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Peers.**	The NTP Peers Configuration List window opens.
5. Click on the IP address of the time server in the NTP Peer list.	
6. Set the **Local Host Mode** parameter. Click on **Help** or see the parameter descriptions on page A-20.	

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
7. Click on **Apply.**	Site Manager sets the mode to Client. Nortel Networks supports only the Client option.
8. Click on **Done**.	You return to the Configuration Manager window.

Specifying the Source IP Address

The source IP address allows you to specify a single IP address that NTP uses to override the source address of the IP interface from which the NTP packet is transmitted. Use this parameter only when you want the remote time server to filter NTP timestamps for the local NTP client based on IP source address. You should using a circuitless IP address as the source IP address.

You might also want to specify a source IP address when you have enabled security features on a time server and you want to restrict access to it.

Using the BCC

By default, the source IP address is 0.0.0.0. To specify a source IP address that overrides the source address of the IP interface from which the NTP packet is transmitted, enter:

src-ip-address <*address*>

For example, the following command line causes NTP to use the source IP address 4.4.4.4 to override the IP interface source address:

```
peer/3.3.3.3# src-ip-address 4.4.4.4
peer/3.3.3.3#
```

Using Site Manager

To specify the source IP address of a remote time server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Peers**.	The NTP Peers Configuration List window opens.
5. Click on the IP address of the time server that appears in the NTP Peer list.	
6. Set the **Source IP Address** parameter. Click on **Help** or see the parameter descriptions on page A-20.	
7. Click on **Apply**.	NTP uses the source IP address that you specify to override the source address of the interface from which the NTP packet is transmitted.
8. Click on **Done**.	You return to the Configuration Manager window.

Specifying Peer Preference

The Peer Preference parameter allows you to specify a list of remote time servers (peers) that are preferred by the local NTP client above and beyond the criteria for selecting peers (stratum setting, closest, and claimed higher precision).

By default, the Peer Preference option value is set to No. This means that the local NTP client rejects packets from the remote time server.

You can enable peer preference for a remote time server by changing the Peer Preference option value to Yes. This means that the local NTP client prefers (accepts) packets from the remote server and synchronizes its internal clock to this server.

To specify whether the local NTP client will prefer or reject NTP packets from the remote time server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Peers**.	The NTP Peers Configuration List window opens.
5. Click on the IP address of the time server that displays in the NTP Peer list.	
6. Set the **Peer Preference** parameter. Click on **Help** or see the parameter descriptions on page A-21.	
7. Click on **Apply**.	When you select **Yes**, the local NTP client prefers (accepts) NTP packets from the remote time server and synchronizes its internal clock to it. When you select **No**, the local NTP client rejects packets from the remote time server.
8. Click on **Done**.	You return to the Configuration Manager window.

Deleting Remote Time Servers from a Router

When you delete a remote time server (peer), NTP deletes the IP address of that time server from the NTP peer list.

Using the BCC

To delete a remote time server (peer), navigate to the peer-specific prompt and enter:

delete

For example, the following command line deletes the time server 3.3.3.3:

```
peer/3.3.3.3# delete
ntp#
```

Using Site Manager

To delete remote time servers from a router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Peers**.	The NTP Peers Configuration List window opens.
5. Click on the IP address of the time server that you want to delete from the NTP Peer list.	
6. Click on **Delete**.	The IP address for the time server you selected is removed from the NTP Peer list.
7. Click on **Done**.	You return to the Configuration Manager window.

Configuring NTP Access Control

The access control feature allows you to selectively restrict NTP clients from accepting NTP timestamps from specific remote time servers on the network by filtering these timestamps based on the source IP address or an IP subnet address. This is similar to an inbound filter that drops NTP packets based on source IP address and IP subnet mask.

Configuring NTP access control for a time server involves:

- Specifying the IP address of the remote time server
- Specifying a filter type
- Specifying an IP subnet mask

Specifying the IP Address of the Time Server

When you specify the IP address of the remote time server whose access to the local NTP client you want to restrict, NTP adds the IP address of the time server to an access control list, which the local NTP client uses when querying remote time servers for time information. Use the access control option when operating in broadcast client and multicast client mode.

To specify the IP address of the remote time server whose access to the local NTP client you want to restrict, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, select **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.
4. Choose **Access**.	The NTP Access Configuration List window opens.
5. Click on **Add**.	The NTP Access Configuration window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
6. Set the **Access IP Address** parameter. Click on **Help** or see the parameter descriptions on page A-18.	
7. Click on **OK**.	The source IP address of the remote time server whose access you want to restrict appears in the NTP Access Configuration List window.

Specifying a Filter Type and IP Subnet Mask

The NTP filter type parameter allows you to specify whether to drop or accept NTP timestamps destined for a local NTP client. By default, the filter type is set to Restrict, which tells NTP to drop specific NTP timestamps destined for a local NTP client based on its source IP address and source subnet mask.

For example, if you have 10 remote time servers broadcasting to a router and you want to receive NTP timestamps from only three remote time servers, you can restrict the other seven remote time servers.

When you set the Filter Type to Prefer, the local NTP client accepts packets received from remote time servers.

The Mask parameter allows you to specify an IP subnet mask address to filter NTP timestamps based on a source subnet.

Using Site Manager

To add access control to a time server, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **NTP**.	The NTP menu opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
4. Choose **Access**.	The NTP Access Configuration List window opens, displaying the IP address of each time server.
5. Click on the IP address of the time server whose access you want to restrict.	
6. Set the following parameters: • **Filter Type** • **Access IP Mask** Click on **Help** or see the parameter descriptions on page A-19.	The Filter Type Selection box opens.
7. Click on **Apply**.	
8. Click on **Done**.	You return to the Configuration Manager window.

Deleting Access for a Time Server

When you delete access for a remote time server (peer), Site Manager removes the IP address of the time server whose access you restricted from the access control list.

Chapter 8
Customizing NetBIOS over IP

This chapter describes how to customize NetBIOS over IP services on the router. It assumes you have configured IP on an interface and started NetBIOS using the default parameters, as described in Chapter 1, “Starting IP Utilities,” and that you understand the NetBIOS over IP concepts described in Chapter 2, “Overview of IP Utilities.”

After you start NetBIOS over IP on the router, default values are in effect for all NetBIOS parameters. You customize NetBIOS over IP by modifying these parameters as described in the following sections.

Topic	Page
Disabling and Reenabling NetBIOS	8-2
Specifying a TTL Value for a Rebroadcast Packet	8-2
Enabling the Insertion of Record Route Option	8-3
Configuring a NetBIOS Cache	8-4
Customizing NetBIOS on an IP Interface	8-10
Configuring a Static NetBIOS Name and Address	8-13
Adding a Traffic Filter to a NetBIOS Interface	8-14

Disabling and Reenabling NetBIOS

When you start NetBIOS on the router, NetBIOS is automatically enabled.

To disable or reenable NetBIOS over IP, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, Choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Enable**/**Disable** parameter. Click on **Help** or see the parameter description on page A-21.	
6. Click on **OK**.	You return to the Configuration Manager window.

Specifying a TTL Value for a Rebroadcast Packet

The TTL value restricts the number of routers a rebroadcast packet can traverse. To prevent NetBIOS broadcast packets from traversing the network indefinitely, set the parameter to a minimal value.

By default, NetBIOS sets the TTL value in each packet to 5. You can use Site Manager to set a TTL value from 1 to 255.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, Choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Rebroadcast Packet TTL** parameter. Click on **Help** or see the parameter description on page A-24.	
6. Click on **OK**.	Site Manager returns you to the Configuration Manager window.

Enabling the Insertion of Record Route Option

The Insertion of Record Route option prevents rebroadcast packets from looping forever by allowing the NetBIOS entity in the router to determine whether it has received this packet before on this interface. If so, the router drops it.

By default, the NetBIOS Insertion of Record Route option in rebroadcast packets is disabled. If all IP entities support this option, enable it on the router. You can use Site Manager to enable the option.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, Choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Rebroadcast Record Route** parameter. Click on **Help** or see the parameter description on page A-25.	
6. Click on **OK**.	Site Manager returns you to the Configuration Manager window.

Configuring a NetBIOS Cache

NetBIOS is a broadcast-intensive protocol. Much of the broadcast overhead is related to maintaining unique names across the network and providing end users with access to NetBIOS applications. The amount of overhead grows with the number of NetBIOS resources (applications, servers, and clients) on the network.

To keep broadcast traffic to a minimum, each router that runs NetBIOS over IP builds and maintains a cache of NetBIOS name/IP address pairs, using information contained in the name query responses it receives and forwards.

In Figure 2-9 on page 2-23, for example:

1. Router A receives a name query response from the server. The router gleans from the name query response the name and IP address of the server.
2. The router stores the name and IP address of the server in its cache.
3. The router forwards the name query response.

Routers that support NetBIOS must analyze each name query request received on a NetBIOS interface to determine whether the name of the requested resource (typically, a server) is in the cache. If so, the router replaces the broadcast address in the request with the unicast IP address of the server. The router then forwards the name query request to the server.

Enabling Name Caching on the Router

NetBIOS name caching enables the router to cache the name associated with each NetBIOS server that is active on the network.

By default, NetBIOS name caching is disabled. You can use Site Manager to enable name caching.

The 15-character NetBIOS name-caching parameter enables the router to treat a NetBIOS name as either a 15- or a 16-character entity.

By default, NetBIOS treats a name as a 16-character entity. You can use Site Manager to enable the feature if you want NetBIOS to treat a name as a 15-character entity.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the following parameters: • **NetBIOS Name Caching** • **15-Character NetBIOS Name Caching** Click on **Help** or see the parameter descriptions beginning on page A-22.	
6. Click on **OK**.	You return to the Configuration Manager window.

Creating a MIB Instance for a Cached Name

By default, NetBIOS creates a MIB instance for each name entry stored in the name cache.

You can use Site Manager to disable the feature if you want to release system memory and processing resources otherwise dedicated to maintaining cached names in the MIB.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Create MIB Inst for Cached Name** parameter. Click on **Help** or see the parameter description on page A-22.	
6. Click on **OK**.	You return to the Configuration Manager window.

Specifying the Size of the Name Cache

By default, NetBIOS allocates space for 100 entries in the name cache. You can adjust this value in direct proportion to the total number of server names expected to be active during intervals of peak traffic load or performance demand on the router. A value of 100 is suitable for networks that include up to 100 NetBIOS names to cache. You can use Site Manager to specify a value from 1 to 2,147,483,647 entries.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Max Name Cache Entries** parameter. Click on **Help** or see the parameter description on page A-23.	
6. Click on **OK**.	Site Manager returns you to the Configuration Manager window.

Aging a Cache Entry

The router ages cache entries to ensure that cached routes remain consistent with the current network topology. If the cache table lookup mechanism does not access a cache entry within the period you set in the appropriate Cache Aging Time parameter, the router deletes the entry from the table.

If the router receives a broadcast name query request from a client and finds the name and associated IP address of the requested server in its cache, the router replaces the broadcast address on the name query request with the unicast IP address. The router also assigns the entry a short time to live. If the entry is valid, the router will receive a positive name query response (which will validate the entry) from the server within the specified time to live. If the entry is invalid, the name query request will not reach the server. In this case, the entry quickly ages out.

By default, inactive NetBIOS names expire from the NetBIOS name cache after 300 seconds.

You can use Site Manager to specify any time value that can rapidly age infrequently referenced names out of the NetBIOS name cache.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Name Cache Age** parameter. Click on **Help** or see the parameter description on page A-23.	
6. Click on **OK**.	Site Manager returns you to the Configuration Manager window.

Choose an aging value that allows infrequently referenced or obsolete server names to expire from the name cache. The smaller the value, the less efficient broadcast reduction is, but the more quickly the network recovers topology changes.

Customizing a Cache Search

The mechanism that NetBIOS uses to search for a name in the cache is based on a fast string hash/search mechanism developed for AppleTalk Zone Name processing. This mechanism uses a hash table that NetBIOS builds and maintains on the router.

Increasing the number of entries in the hash table:

- Decreases the number of names the router must compare before finding a specific cached name
- Decreases the amount of time the router takes to find a particular cached name
- Increases memory usage

For networks that actively use up to 2500 NetBIOS server names, use the default value (253). To determine a hash entry count for larger networks:

- Divide the total number of unique NetBIOS server names active in the network by 10.
- Adjust the quotient to the nearest (higher or lower) prime number. (A prime number can only be divided by itself or by 1 and still yield a whole-number quotient.)
- Replace the default value with the new, calculated number.

Increasing the number of hash table entries does not increase the number of names that a router can cache. With larger networks, increasing the size of the hash tables may, however, reduce internal cache lookup time, thereby improving overall performance.

You can use Site Manager to specify the number of entries you want to allow in the cache lookup tables.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Global**.	The Edit NetBIOS/IP Global Parameters window opens.
5. Set the **Hash Entry Count** parameter. Click on **Help** or see the parameter description on page A-24.	
6. Click on **OK**.	Site Manager returns you to the Configuration Manager window.

Customizing NetBIOS on an IP Interface

NetBIOS software on the router communicates with NetBIOS clients and servers through IP interfaces that have been configured with NetBIOS. You can customize the default values for NetBIOS on an IP interface.

Disabling and Reenabling NetBIOS on an Interface

When you configure NetBIOS on an interface, NetBIOS is automatically enabled. You can use Site Manager to disable and reenable NetBIOS on the interface.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Interface**.	The NetBIOS/IP Interface Table window opens.
5. Click on the IP interface that you want to modify.	The parameter values for that interface appear in the window.
6. Set the **Enable/Disable** parameter. Click on **Help** or see the parameter description on page A-25.	
7. Click on **Apply**, then click on **Done**.	You return to the Configuration Manager window.

Disabling and Reenabling Name Caching on the Interface

By default, NetBIOS name caching is enabled on the interface. You can disable name caching if you want to release system memory and processing resources otherwise dedicated to server name caching.

You can use Site Manager to disable or reenable this interface for caching the name of each NetBIOS server active in the network.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Interface**.	The NetBIOS/IP Interface Table window opens.
5. Click on the IP interface that you want to modify.	The parameter values for that interface appear in the window.
6. Set the **NetBIOS Name Caching** parameter. Click on **Help** or see the parameter description on page A-26.	
7. Click on **Apply**, and then click on **Done**.	You return to the Configuration Manager window.

Disabling Inbound and Outbound Broadcasts

By default, NetBIOS can receive inbound broadcasts on the interface and send outbound broadcasts. You can use Site Manager to disable this feature on the interface.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Interface**.	The NetBIOS/IP Interface Table window opens.
5. Click on the IP interface that you want to modify.	

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
6. Set the following parameters: • **Enable NetBIOS Inbound Broadcasts** • **Enable NetBIOS Outbound Broadcasts** Click on **Help** or see the parameter descriptions beginning on page A-26.	
7. Click on **Apply**, then click on **Done**.	You return to the Configuration Manager window.

Supplying a Rebroadcast Address

By default, NetBIOS uses the IP broadcast address configured for this interface when rebroadcasting NetBIOS packets out this interface. You can use Site Manager to supply a rebroadcast address that overrides this broadcast address.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Interface**.	The NetBIOS/IP Interface Table window opens.
5. Click on the IP interface that you want to modify.	
6. Set the **Rebroadcast Address** parameter. Click on **Help** or see the parameter description on page A-27.	
7. Click on **Apply**, then click on **Done**.	You return to the Configuration Manager window.

Configuring a Static NetBIOS Name and Address

You can add static NetBIOS names to the router. These entries are independent of the name entries learned dynamically in the name cache.

Creating the NetBIOS Static Entry

To create a NetBIOS static entry, you must specify:

- The name of the NetBIOS station (from 1 to 16 characters)
- The IP address of the NetBIOS station
- The NetBIOS scope identifier

  The NetBIOS scope is the area of the network across which the name is known. The scope ID is a character string that meets the requirements outlined in the DNS specification (RFC 833).

You can use Site Manager to create a static entry.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Static Name**.	The NetBIOS/IP Static Entry Table window opens.
5. Click on **Add**.	The NBIP Addresses window opens.
6. Set the following parameters: • **NetBIOS Station Name** • **IP Address** • **NetBIOS Scope ID** Click on **Help** or see the parameter descriptions beginning on page A-28.	
7. Click on **OK**.	You return to the Configuration Manager window.

Disabling and Reenabling Static Name Caching

By default, NetBIOS caches the names you added statically. You can use Site Manager to disable and reenable this feature.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **NetBIOS**.	The NetBIOS menu opens.
4. Choose **Static Name**.	The NetBIOS/IP Static Entry Table window opens.
5. Click on the static entry that you want to modify.	
6. Set the **Enable** parameter. Click on **Help** or see the parameter description on page A-27.	
7. Click on **Apply**, then click on **Done**.	You return to the Configuration Manager window.

Adding a Traffic Filter to a NetBIOS Interface

If name caching is enabled, a router that receives a name query response (originating from a server and addressed to a client) must be able to deliver the message to the NetBIOS entity on the router (rather than simply forward it out another interface toward its destination).

To enable the router to recognize a unicast IP packet that contains a name query response and pass it to NetBIOS through UDP port 137, you must configure a traffic filter on each NetBIOS interface that receives unicast name query responses.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Circuits**.	The Circuits menu opens.
2. Choose **Edit**.	The Circuit List window opens.
3. Click on **Edit**.	The Circuit Definition window open.
4. Choose **Protocols**.	The Protocols menu opens.
5. Choose **Edit IP**.	The Edit IP menu opens.
6. Choose **Traffic Filters**.	The IP Filters window opens.
7. Click on **Template**.	The Filter Template Management window opens.
8. Click on **Create**.	The Create IP Template window opens.
9. Choose **Criteria**.	The Criteria menu opens.
10. Choose **Add**.	The Add menu opens.
11. Choose **UDP Frame**.	The UDP Frame menu opens.
12. Choose **Destination Port**.	The Edit Range screen opens.
13. Type **137** for the minimum value and the maximum value.	
14. Click on **OK**.	The Create IP Template window opens.
15. Choose **Action**.	The Action menu opens.
16. Choose **Add**.	The Add menu opens.
17. Choose **Forward to Next Hop**.	The Next Hop window opens.
18. Type the IP address of this interface (the interface on which you are configuring the traffic filter). Then click on **OK**.	

Chapter 9
Customizing the DNS Client

When you create the DNS client, default values are in effect for all parameters. You may want to change these values, depending on the requirements of your network.

This chapter provides information about how to customize the DNS client configuration. It includes information about the following topics:

Topic	Page
Disabling and Reenabling the DNS Client	9-2
Modifying the DNS Client Configuration	9-3
Disabling the Recursion Bit	9-5
Modifying How the DNS Client Handles Server Responses	9-6
Modifying the DNS Server List	9-7
Deleting DNS Client Services from the Router	9-10

Disabling and Reenabling the DNS Client

You can disable or reenable DNS client services on the router using either the BCC or Site Manager.

Using the BCC

To disable DNS client services on all circuits on the router, navigate to the DNS prompt and enter the following command:

disable

To reenable DNS client services on the router, navigate to the DNS prompt and enter the following command:

enable

For example, the following command sequence disables and reenables DNS client services on the router:

```
dns# disable
dns# enable
dns# state ?
   state enabled
```

Using Site Manager

To disable or reenable the DNS client on the router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **Global**.	The Edit DNS Global Parameters window opens.
5. Set the **Enable** parameter. Click on **Help** or see the parameter description on page A-29.	
6. Click on **OK**.	You return to the Configuration Manager window.

Modifying the DNS Client Configuration

You can modify how the router makes requests to the DNS server, for example, how often requests are repeated and how long it waits between requests.

Using the BCC

To modify how the router sends DNS requests, navigate to the DNS prompt and enter one or more of the following parameters:

time-out <*integer*>

integer is a value from 1 to 60 seconds.

max-retransmissions <*integer*>

integer is a value from 0 to 15 seconds.

max-outstanding-queries <*integer*>

integer is a value from 1 to 100.

tos <*service_type*>

service_type is either normal or lowdelay.

domain-name <*name*>

name is an alphanumeric character string representing the default domain name that the router uses when trying to reach a DNS server.

use-default-domain <*state*>

state is either enabled or disabled. This parameter is valid only if you specified the domain-name parameter.

hosts-file <*path*>

path is the name of or path to a file in flash memory that contains a list of default host name/IP address pairs. If you specify a host file, the DNS client first checks whether the host name exists locally in the host file. If not, the DNS client sends an address-resolution request to one of the configured DNS servers. The larger the host file, the slower the lookup.

For example, the following commands change how the router sends DNS requests:

```
dns# time-out 10
dns# max-retransmissions 15
dns# max-outstanding-queries 6
dns# tos normal
dns# domain-name nortelnetworks.com
dns# use-default-domain disabled
dns# hosts-file lookhere
```

Using Site Manager

To modify how the router sends DNS requests, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **Global**.	The Edit DNS Global Parameters window opens.
5. Edit one or more of the following parameters: • **Time Out** • **Max Retransmission** • **Max Outstanding Query** • **IP Type of Service** • **Domain Name** • **Use Default Domain Name** Click on **Help** or see the parameter descriptions beginning on page A-29.	
6. Click on **OK**.	You return to the Configuration Manager window.

Disabling the Recursion Bit

If the first DNS server that the router contacts does not have the requested information, you can set a recursion bit in the DNS information header packet. This bit instructs that server to contact another server that can respond to the request.

The recursion bit is enabled by default. If you do not want to contact more than one server, you must disable the recursion bit.

Using the BCC

To disable the recursion bit, navigate to the DNS prompt and enter:

```
dns# recursion disabled
dns#
```

To reenable the recursion bit, navigate to the DNS prompt and enter:

```
dns# recursion enabled
dns#
```

Using Site Manager

To disable the recursion bit, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **Global**.	The Edit DNS Global Parameters window opens.
5. Set the **Recursion** parameter to **Disable**. Click on **Help** or see the parameter description on page A-31.	
6. Click on **OK**.	You return to the Configuration Manager window.

Modifying How the DNS Client Handles Server Responses

You can specify whether the router accepts the DNS server's response when it contains a truncation bit, or whether the router accepts data only from the authorized DNS server.

Using the BCC

To modify how the DNS client handles server responses, navigate to the DNS prompt and enter:

ignore-truncation <*state*>

state is enabled or disabled.

authoritative-only <*state*>

state is enabled or disabled.

For example, the following commands tell the router not to accept DNS server responses that contain the truncation bit in the DNS header and to accept data only from an authorized server:

```
dns# ignore-truncation disabled
dns# authoritative-only enabled
```

Using Site Manager

To modify how the DNS client handles server responses, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **Global**.	The Edit DNS Global Parameters window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Edit one or both of the following parameters: • **Ignore Truncation Error** • **Use Auth Answer Only** Click on **Help** or see the parameter descriptions on page A-32.	
6. Click on **OK**.	You return to the Configuration Manager window.

Modifying the DNS Server List

The DNS server list contains the DNS servers (up to three) that the DNS client can query. You can display the list of servers, add entries to the list, and delete entries from it.

Displaying the DNS Server List

You can view the list of DNS servers to which the router can connect using either the BCC or Site Manager.

Using the BCC

To view the list of all DNS servers to which the router can connect, enter the following command at any BCC prompt:

```
box# show dns server

DNS Servers:
---------------
Server    Address      Port
----------------------------------------
   1  1.1.1.1         53
   2  2.2.2.2         54
   3  3.3.3.3         55
```

Using Site Manager

To view the list of DNS servers to which the router can connect, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **DNS Servers**.	The DNS Server List window opens. This window lists all configured DNS servers.
5. Select a server from the list.	The DNS Server List window displays the IP address and DNS port for the selected server.
6. Click on **Done**.	You return to the Configuration Manager window.

Adding Entries to the DNS Server List

You can add entries, for a total of three, to the DNS server list.

Using the BCC

To add a new entry (up to a maximum of three) to the DNS server list, navigate to the DNS prompt and enter the following command:

`dns#` **name-server number** *<server_number>* **address** *<address>*

server_number is the number (1 through 3) of the DNS server.

address is the IP address of the DNS server.

For example, the following command adds the first DNS server, with an IP address of 1.1.1.1:

```
dns# name-server number 1 address 1.1.1.1
dns#
```

Using Site Manager

To add a new entry (up to a maximum of three) to the DNS server list, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **DNS Servers**.	The DNS Server List window opens. This window lists all configured DNS servers.
5. Click on **Add**.	The DNS Server Record window opens.
6. Set the following parameters: • **Index** • **IP Address** • **Port Number** Click on **Help** or see the parameter descriptions beginning on page A-33.	
7. Click on **OK**.	The DNS Server List window reopens.
8. Click on **Apply** and **Done**.	You return to the Configuration Manager window.

Deleting Entries from the DNS Server List

You can delete an entry from the DNS server list using either the BCC or Site Manager.

Using the BCC

To delete an entry from the DNS server list, navigate to the prompt for the name server that you want to delete and enter the following command:

delete

For example, the following command deletes the first DNS server in the list:

```
name-server/1# delete
dns#
```

Using Site Manager

To delete an entry from the DNS server list, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **DNS Servers**.	The DNS Server List window opens. This window lists all configured DNS servers.
5. Select the server that you want to delete.	Site Manager highlights the entry.
6. Click on **Delete**.	Site Manager removes the entry.
7. Click on **OK**.	The DNS Server List window reopens.
8. Click on **Apply** and **Done**.	You return to the Configuration Manager window.

Deleting DNS Client Services from the Router

You can delete DNS client services from the router using either the BCC or Site Manager.

Using the BCC

To delete DNS client services from the router, navigate to the DNS prompt and enter the following command:

delete

For example, the following command deletes DNS client services from the router:

```
dns# delete
box#
```

Using Site Manager

To delete DNS client services from the router, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **Delete DNS**.	A message window prompts: `Do you REALLY want to delete DNS?`
5. Click on **OK**.	You return to the Configuration Manager window.

Chapter 10
Customizing the DNS Proxy

When you create the DNS proxy, default values are in effect for all parameters. You can change these values to match the requirements of your network.

This chapter provides information about how to customize the DNS proxy configuration.

Modifying the DNS Proxy Configuration

You can modify how the DNS proxy on the router makes requests to the DNS server, for example, how often the DNS proxy repeats requests and how long it waits between requests.

To modify how the router sends DNS requests, complete the following tasks:

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **Global Protocols**.	The Global Protocols menu opens.
3. Choose **DNS**.	The DNS menu opens.
4. Choose **DNS Proxy**.	The DNS Proxy List window opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
5. Edit one or more of the following parameters: • **Enable/Disable** • **Proxy Mode** • **Proxy Listen Port Number** • **DNS Server 1** • **DNS Server 2** • **DNS Server 3** • **DNS Server Port Number** • **Timeout (in secs)** • **Max. Retransmissions** • **Max. Outstanding Req.** • **Answer Truncation** • **Trunc. Max. Allowed** • **Cache Size** Click on **Help** or see the parameter descriptions beginning on page A-39.	
6. Click on **OK**.	You return to the Configuration Manager window.

Appendix A
Site Manager Parameters

This appendix contains the Site Manager parameter descriptions for TCP, FTP, TFTP, Telnet, NTP, DNS, NetBIOS, and IP accounting. You can display the same information using Site Manager online Help.

Topic	Page
TCP Global Parameters	A-3
FTP Global Parameters	A-5
TFTP Parameters	A-8
Telnet Server Global Parameters	A-9
Telnet Client Global Parameters	A-16
NTP Parameters	A-17
NetBIOS Global Parameters	A-21
NetBIOS/IP Interface Table Parameters	A-25
NetBIOS/IP Static Entry Table Parameters	A-27
DNS Global Parameters	A-29
DNS Server Record Parameters	A-33
DNS Proxy Server Parameters	A-34
IP Accounting Parameters	A-43

For each parameter, this appendix provides the following information:

- Parameter name
- Configuration Manager menu path
- Default setting
- Valid parameter options
- Parameter function
- Instructions for setting the parameter
- Management information base (MIB) object ID

The Technician Interface allows you to modify parameters by issuing **set** and **commit** commands with the MIB object ID. This process is equivalent to modifying parameters using Site Manager. For more information about using the Technician Interface to access the MIB, see *Using Technician Interface Software*.

Caution: The Technician Interface does not verify the validity of your parameter values. Entering an invalid value can corrupt your configuration.

TCP Global Parameters

Use the following guidelines to configure TCP global parameters in the Configuration Manager window.

Parameter: Enable/Disable

Path: Configuration Manager > Protocols > Global Protocols > TCP > Global

Default: Enable

Options: Enable | Disable

Function: Enables or disables TCP on the router.

Instructions: Select Disable to disconnect from TCP. Also, you can select Disable if you do not need TCP, but want to access previous TCP statistics.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.3.1.2

Parameter: Min. Retransmission Timeout (msec.)

Path: Configuration Manager > Protocols > Global Protocols > TCP > Global

Default: 250

Options: 100 through 15000 ms

Function: Sets the minimum value for the retransmission timeout. When one side of a TCP connection sends a frame and does not receive an acknowledgment from the other side of the connection within the timeout period, the sending station retransmits the frame.

Instructions: Specify the value you want to use for the minimum timeout period. If you are transmitting on a high-speed network and you set the parameter value too high, network performance may degrade, because TCP must wait for the timeout period to elapse before retransmitting unacknowledged data.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.3.1.5

Parameter:	**Max. Retransmission Timeout (msec.)**
Path:	Configuration Manager > Protocols > Global Protocols > TCP > Global
Default:	240000
Options:	15000 to 240000 ms
Function:	Sets the maximum value for the retransmission timeout. When one side of a TCP connection sends a frame and does not receive an acknowledgment from the other side of the connection within the timeout period, the sending station retransmits the frame.
Instructions:	Specify the value you want to use for the maximum timeout period. If you are transmitting on a low-speed network and you set the parameter value too low, the network may become congested as TCP retransmits unacknowledged frames that have not yet reached their destination.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.3.1.6

Parameter:	**Max. Window Size (bytes)**
Path:	Configuration Manager > Protocols > Global Protocols > TCP > Global
Default:	4096
Options:	512 through 65535 bytes
Function:	Sets the maximum transmit-and-receive window size that TCP allows for each connection.
Instructions:	Specify the window size. The larger the window size, the more memory each TCP connection consumes.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.3.1.18

FTP Global Parameters

Use the following guidelines to configure the parameters in the Edit FTP Global Parameters window.

Parameter: Enable/Disable

Path: Configuration Manager > Protocols > Global Protocols > FTP > Global
Default: Enable
Options: Enable | Disable
Function: Specifies whether the FTP subsystem is enabled or disabled.
Instructions: Specify Disable if you want to disable FTP on the router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.10.1.2

Parameter: Default Volume

Path: Configuration Manager > Protocols > Global Protocols > FTP > Global
Default: 2
Options: 1 to 13 | 1a to 4a | 1b to 4b
Function: Specifies the number of the file system volume to which FTP writes transferred files and from which FTP retrieves files for transfer.
Instructions: Specify the appropriate volume number. If you are configuring an AN router, you must specify 1.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.10.1.3

Parameter: Login Retries

Path: Configuration Manager > Protocols > Global Protocols > FTP > Global
Default: 3
Options: 0 to 5 retries
Function: Specifies the number of FTP login retries allowed after a login failure.
Instructions: Enter a value representing the number of login attempts that FTP will accept after a login failure before rejecting logins.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.10.1.4

Parameter:	**Idle Time Out (secs)**
Path:	Configuration Manager > Protocols > Global Protocols > FTP > Global
Default:	900
Options:	1 to 10000 seconds
Function:	Specifies the length of time (in seconds) that FTP waits before closing an idle FTP control connection.
Instructions:	Determine the maximum idle time that you want to allow and specify the time value in seconds.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.10.1.5

Parameter:	**Max. Sessions**
Path:	Configuration Manager > Protocols > Global Protocols > FTP > Global
Default:	3
Options:	1 to 10000 sessions
Function:	Specifies the maximum number of FTP sessions allowed at one time.
Instructions:	Determine the maximum number of simultaneous sessions that you want to allow and specify a value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.10.1.6

Parameter:	**Type of Service**
Path:	Configuration Manager > Protocols > Global Protocols > FTP > Global
Default:	Binary
Options:	Binary | ASCII
Function:	Specifies the current data transmission type.
Instructions:	To transfer files consisting of ASCII characters, specify ASCII transmission. For non-ASCII files, specify Binary.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.10.1.7

Parameter: Control Connection

Path: Configuration Manager > Protocols > Global Protocols > FTP > Global
Default: Low Delay
Options: Normal | Low Delay
Function: Specifies the Type of Service value that FTP inserts in IP datagrams on a control connection.
Instructions: Choose the option that determines how the Internet transport layer handles datagrams on a control connection.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.10.1.8

Parameter: Data Transfer

Path: Configuration Manager > Protocols > Global Protocols > FTP > Global
Default: High Throughput
Options: Normal | High Throughput
Function: Specifies the Type of Service value that FTP inserts in IP datagrams on a data transfer connection.
Instructions: Choose the option that determines how the Internet transport layer handles datagrams on a data transfer connection.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.10.1.9

Parameter: TCP Window Size

Path: Configuration Manager > Protocols > Global Protocols > FTP > Global
Default: 60000
Options: 5000 to 64000 bytes
Function: Specifies the size of the windows used for TCP connections.
Instructions: Determine the window size that you require and specify the size in bytes.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.10.1.10

TFTP Parameters

Use the following guidelines to configure the parameters in the Edit TFTP Parameters window.

Parameter: Enable

Path: Configuration Manager > Protocols > IP > TFTP > Edit TFTP Parameters
Default: Enable
Options: Enable | Disable
Function: Specifies whether TFTP is enabled for the IP router.
Instructions: Select Enable to enable TFTP for the IP router. Because TFTP allows write access to the router's file system, you should not enable TFTP in network environments in which you are concerned with security. Select Disable to disable TFTP for the IP router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.6.1

Parameter: Default Volume

Path: Configuration Manager > Protocols > IP > TFTP > Edit TFTP Parameters
Default: 2
Options: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14
Function: Specifies which of the router's slots will be used, by default, for all TFTP GETs and PUTs.
Instructions: Specify the appropriate slot number. If you are configuring an AN router, you must specify slot 1.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.6.2

Parameter: Retry Time Out

Path: Configuration Manager > Protocols > IP > TFTP > Edit TFTP Parameters
Default: 5
Options: Any number of seconds
Function: Specifies the number of seconds that TFTP waits for an acknowledgment before retransmitting the last packet.
Instructions: Specify the appropriate number of seconds.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.6.4

Parameter: Close Time Out

Path: Configuration Manager > Protocols > IP > TFTP > Edit TFTP Parameters
Default: 25
Options: Any number of seconds
Function: Specifies the number of seconds that TFTP waits, after it has successfully received a file, to make sure that the sender has received the last acknowledgment.
Instructions: Specify the appropriate number of seconds.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.6.5

Parameter: Retransmit

Path: Configuration Manager > Protocols > IP > TFTP > Edit TFTP Parameters
Default: 5
Options: Any number of retransmissions
Function: Specifies the number of times that TFTP retransmits an unacknowledged message before abandoning the transfer attempt.
Instructions: Specify the number of retransmissions.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.6.6

Telnet Server Global Parameters

Use the following guidelines to configure the Telnet server global parameters in the Edit Telnet Server Global Parameters window.

Parameter: Enable/Disable

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default: Enable
Options: Enable | Disable
Function: Specifies whether Telnet is enabled for the IP router, allowing you to establish incoming Telnet sessions to the Technician Interface.
Instructions: Select Enable to enable Telnet for the IP router. Select Disable to disable Telnet for the IP router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.2

Parameter: TI Lines per Screen

Path:	Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default:	24
Options:	1 to 24 lines
Function:	Specifies the maximum number of lines displayed on the Telnet Technician Interface console screen. The screen may override the number of lines you specify if Telnet can negotiate the window size with the remote client.
Instructions:	Set according to your console requirements.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.7.1.3

Parameter: TI More

Path:	Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default:	Enable
Options:	Enable | Disable
Function:	Specifies whether the Technician Interface pauses after each screen fills with data.
Instructions:	Select Enable to configure the Technician Interface to pause after each screen fills with data. Select Disable to configure the Technician Interface not to pause after each screen fills with data.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.7.1.4

Parameter: TI Prompt

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: None

Options: 1 to 18 alphanumeric characters

Function: Specifies the character string used as the login prompt on the Telnet Technician Interface console screen.

Instructions: Specify a character string.

Site Manager disconnects the current session if you modify the TI Prompt parameter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.5

Parameter: Login Timeout (min.)

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: 1

Options: 1 to 99 minutes (99 = infinity)

Function: Specifies the number of minutes that can elapse before the Technician Interface disconnects the Telnet session if you do not enter a login ID at the login prompt.

Instructions: Accept the default value (1 minute) or specify a different value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.6

Parameter: Password Timeout (min.)

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: 1

Options: 1 to 99 minutes (99 = infinity)

Function: Specifies the number of minutes that can elapse before the Technician Interface disconnects the Telnet session if you do not enter a password at the password prompt.

Instructions: Accept the default value (1 minute) or specify a different value.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.7

Parameter: Command Timeout (min.)

Path:	Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default:	15
Options:	1 to 99 minutes (99 = infinity)
Function:	Specifies the number of minutes that can elapse before the Technician Interface disconnects the Telnet session if you do not enter a command at the command prompt.
Instructions:	Accept the default value (15 minutes) or specify a different value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.7.1.8

Parameter: Login Retries

Path:	Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default:	3
Options:	1 to 99 login attempts
Function:	Specifies the maximum number of login attempts allowed before the Technician Interface disconnects the Telnet session.
Instructions:	Accept the default value (3) or specify a different value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.7.1.9

Parameter: Diagnostic Report

Path:	Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default:	Disable
Options:	Enable | Disable
Function:	Specifies whether the Technician Interface displays a record of processing operations. Used for diagnostic purposes only.
Instructions:	Accept the default (Disable). This parameter is for field service personnel only.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.7.1.15

Parameter: Diagnostic Exercise

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default: Disable
Options: Enable | Disable
Function: Used for diagnostic purposes only.
Instructions: Accept the default (Disable). This parameter is for field service personnel only.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.16

Parameter: Diagnostic Network Data

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default: Disable
Options: Enable | Disable
Function: Specifies whether the Technician Interface displays Telnet protocol information. Used for diagnostic purposes only.
Instructions: Accept the default (Disable). This parameter is for field service personnel only.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.17

Parameter: Diagnostic PTY Data

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global
Default: Disable
Options: Enable | Disable
Function: Specifies whether the Technician Interface displays pseudo-terminal driver (PTY) information. Used for diagnostic purposes only.
Instructions: Accept the default (Disable). This parameter is for field service personnel only.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.18

Parameter: Diagnostic Options

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: Disable

Options: Enable | Disable

Function: Specifies whether the Technician Interface displays Telnet options information. Used for diagnostic purposes only.

Instructions: Accept the default (Disable). This parameter is for field service personnel only.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.19

Parameter: Manager's Login Script

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: *automgr.bat*

Options: The name of the manager's login script file

Function: At login, executes the manager's login script file automatically.

Instructions: If you did not change the name of the manager's login script file, accept the default. Otherwise, enter the new name (must be 8 characters or fewer).

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.21

Parameter: User's Login Script

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: *autouser.bat*

Options: The name of the user's login script file

Function: At login, executes the user's login script file automatically.

Instructions: If you did not change the name of the user's login script file, accept the default. Otherwise, enter the new name (must be 8 characters or fewer).

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.22

Parameter: **Force User Logout**

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: Disable

Options: Enable | Disable

Function: Specifies whether the user can press control-c to cancel a user autoscript at login (when a user autoscript is in effect).

Instructions: Set the parameter to Enable to prevent using control-c to cancel the user autoscript at login.
Set the parameter to Disable to allow the user to press control-c to cancel the user autoscript at login.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.23

Parameter: **TI History Depth**

Path: Configuration Manager > Protocols > Global Protocols > Telnet Server > Global

Default: 20

Options: 1 to 40 commands

Function: Specifies the maximum number of Technician Interface commands stored in the local command history table. The table stores each command you enter at the Technician Interface prompt, on a first-in, first-out (FIFO) basis.

Instructions: Set the maximum number of commands that you want the router to store for subsequent recall with the Technician Interface **history** command.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.1.24

Telnet Client Global Parameters

Use the following guidelines to configure the parameters in the Edit Telnet Client Global Parameters window.

Parameter: Enable/Disable

Path: Configuration Manager > Protocols > Global Protocols > Telnet Client > Global

Default: Enable

Options: None

Function: Specifies whether the Telnet client is enabled for the IP router, allowing you to establish outbound Telnet sessions from the Technician Interface to another router or to a UNIX station that supports Telnet.

Instructions: Select Enable to enable the Telnet client for the IP router or Disable to disable it.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.2.2

Parameter: Verbose Debug Logging

Path: Configuration Manager > Protocols > Global Protocols > Telnet Client > Global

Default: OFF

Options: ON | OFF

Function: Specifies whether the Technician Interface displays the negotiation process between the Telnet server and Telnet client. This parameter is for diagnostic use only.

Instructions: Select ON to enable verbose debug logging or OFF to disable it.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.2.3

Parameter: **Remote Port**
Path: Configuration Manager > Protocols > Global Protocols > Telnet Client > Global
Default: 23
Options: Any valid TCP port number
Function: Specifies the default remote Telnet server's TCP port.
Instructions: Enter the appropriate value for the default remote Telnet server's TCP port.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.2.4

Parameter: **Prompt**
Path: Configuration Manager > Protocols > Global Protocols > Telnet Client > Global
Default: None
Options: Any text string less than 40 characters long
Function: Specifies the default Telnet client command prompt.
Instructions: Enter any text string less than 40 characters long, for example, Router1%.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.7.2.5

NTP Parameters

Use the following guidelines to configure NTP parameters.

Parameter: **Enable/Disable**
Path: Configuration Manager > Protocols > Global Protocols > NTP > Global
Default: Enable
Options: Enable | Disable
Function: Enables or disables the NTP subsystem on the network device.
Instructions: To disable the NTP subsystem on the network device, specify Disable.
MIB Object ID: 1.3.6.1.4.1.1.18.3.5.3.17.1.1.3

Parameter: Mode

Path: Configuration Manager > Protocols > Global Protocols > NTP > Global
Default: Client
Options: Client │ BClient │ MClient
Function: Specifies the mode in which you want NTP to run on the router.
Instructions: Specify unicast client (Client), broadcast client (BClient), or multicast client (MClient).
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.17.1.1.4

Parameter: Peer IP Address

Path: Configuration Manager > Protocols > Global Protocols > NTP > Peers > **Add**
Default: None
Options: 0.0.0.0 or any valid IP address
Function: Specifies the IP address of the remote time server (peer) that you want to configure. NTP adds the IP address of the remote time server to a peer list. NTP uses this peer list when querying remote time servers for time information to determine the best remote time server from which to synchronize its internal clock.
Instructions: Specify the IP address of the remote time server (peer).
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.17.3.1.6

Parameter: Access IP Address

Path: Configuration Manager > Protocols > Global Protocols > NTP > Access > **Add**
Default: None
Options: 0.0.0.0 or any valid IP address
Function: Allows you to configure the source IP address of the remote time server whose access to the NTP local NTP client you want to restrict.
Instructions: Enter the IP address of the remote time server whose access you want to restrict.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.17.2.1.3

Parameter: Filter Type

Path: Configuration Manager > Protocols > Global Protocols > NTP > Access

Default: Restrict

Options: Restrict | Prefer

Function: Specifies whether to drop or accept inbound NTP timestamps destined for a local NTP client. The local NTP client will filter packets from a remote time server whose IP address you have restricted based on its source IP address and source subnet mask.

Instructions: Specify Restrict or Prefer.

When you specify Prefer, NTP disables filtering on a specific remote time server's IP address or a range of remote time servers' IP addresses.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.17.2.1.2

Parameter: Access IP Mask

Path: Configuration Manager > Protocols > Global Protocols > NTP > Access

Default: None

Options: 0.0.0.0 or any valid IP address

Function: Specifies an IP subnet mask address to filter NTP timestamps based on a source subnet. NTP drops all packets sent from a specific remote time server on a specified subnet.

Instructions: Specify the IP subnet mask address of the filter.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.17.2.1.4

Parameter: Config Peer Mode

Path: Configuration Manager > Protocols > Global Protocols > NTP > Peers

Default: Server

Options: Server only

Function: Specifies the mode for the remote time server (peer). By default, Config Peer Mode is set to Server.

Instructions: To configure a remote time server (peer), click on Add and specify the peer's IP address. Nortel Networks currently supports only the Server option.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.17.3.1.3

Parameter:	**Local Host Mode**
Path:	Configuration Manager > Protocols > Global Protocols > NTP > Peers
Default:	Client
Options:	Client only
Function:	Specifies the local mode in which you want to configure the local NTP client. Currently, Nortel Networks supports only unicast client mode.
Instructions:	Accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.17.3.1.5

Parameter:	**Source IP Address**
Path:	Configuration Manager > Protocols > Global Protocols > NTP > Peers
Default:	None
Options:	Any valid IP address
Function:	Allows you to specify a single IP address that NTP uses to override the source address of the interface from which the NTP packet is transmitted. You use this parameter only when you want the remote time server to filter NTP packets based on IP source address. We recommend using a circuitless IP address as the source IP address. If you do not specify a source IP address, NTP uses the IP address of the outbound router IP interface.
Instructions:	Specify the source IP address of a remote time server.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.17.3.1.7

Parameter:	**Peer Preference**
Path:	Configuration Manager > Protocols > Global Protocols > NTP > Peers
Default:	No
Options:	Yes | No
Function:	Allows you to specify whether the local NTP client will prefer (accept) or rejects NTP packets from the remote time server.
Instructions:	When you select Yes, the local NTP client prefers (accepts) NTP packets from the remote time server and synchronizes its internal clock to it. When you select No, the local NTP client rejects packets from the remote time server.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.17.3.1.8

NetBIOS Global Parameters

Use the following guidelines to configure the parameters in the Edit NetBIOS/IP Global Parameters window.

Parameter:	**Enable/Disable**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Global
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables NetBIOS on this router.
Instructions:	If NetBIOS has been configured on this router, use this parameter to disable and reenable it as required.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.1.2

Parameter: NetBIOS Name Caching

Path: Configuration Manager > Protocols > IP > NetBIOS > Global

Default: Disable

Options: Enable │ Disable

Function: Globally enables or disables the ability of the router to cache the name associated with each NetBIOS server that is active on the network.

Instructions: Select Enable to activate NetBIOS server name caching at every NetBIOS interface configured on the node.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.1.4

Parameter: 15-Character NetBIOS Name Caching

Path: Configuration Manager > Protocols > IP > NetBIOS > Global

Default: Disable

Options: Enable │ Disable

Function: Enables or disables the ability of the router to treat a NetBIOS name as either a 15- or a 16-character entity.

Instructions: Select Enable to activate 15-character NetBIOS name caching at every NetBIOS interface configured on this router. Select Disable if you want NetBIOS to treat names as 16-character entities.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.1.5

Parameter: Create MIB Inst for Cached Name

Path: Configuration Manager > Protocols > IP > NetBIOS > Global

Default: Enable

Options: Enable │ Disable

Function: Enables or disables the ability of the system to:

- Create a MIB instance for each name entry stored in the name cache.
- Delete a MIB instance for each NetBIOS name entry that ages out of the name cache.

Instructions: Select Disable if you want to release the system memory and processing resources otherwise dedicated to maintaining cached names in the MIB.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.1.6

Parameter: Max Name Cache Entries

Path:	Configuration Manager > Protocols > IP > NetBIOS > Global
Default:	100
Options:	1 to 2147483647 entries
Function:	Specifies the maximum number of entries you need to provide in the NetBIOS name cache.
Instructions:	You can adjust the value of this parameter in direct proportion to the total number of server names expected to be active during intervals of peak traffic load or performance demand on the router. A value of 100 is suitable for networks that include up to 100 NetBIOS names to cache.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.1.7

Parameter: Name Cache Age

Path:	Configuration Manager > Protocols > IP > NetBIOS > Global
Default:	300
Options:	Any value (in seconds) that can rapidly age infrequently referenced names out of the NetBIOS name cache
Function:	Specifies an age (in seconds) when inactive NetBIOS names expire from the NetBIOS name cache.
Instructions:	Choose an aging value that allows infrequently referenced or obsolete server names to expire from the name cache. The smaller the value, the less efficient broadcast reduction is, but the more quickly the network recovers topology changes.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.1.9

Parameter:	**Hash Entry Count**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Global
Default:	253
Options:	Any integer value
Function:	Specifies the number of entries you want to allow in the cache lookup tables. Each NetBIOS interface has a local table to store and retrieve the names of NetBIOS servers active on the network.
Instructions:	For networks that actively use up to 2500 NetBIOS server names, use the default value (253). To determine a hash entry count for larger networks, divide the total number of unique NetBIOS server names active in the network by 10; adjust the quotient to the nearest (higher or lower) prime number; and replace the default value with the new, calculated number. Increasing the number of hash table entries does not increase the number of names that a router can cache. With larger networks, increasing the size of the hash tables may, however, reduce internal cache lookup time, thereby improving overall performance.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.1.10

Parameter:	**Rebroadcast Packet TTL**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Global
Default:	5
Options:	1 to 255 seconds
Function:	Specifies the time-to-live value (in seconds) to use in rebroadcast packets.
Instructions:	Use this parameter to restrict the number of routers a rebroadcast packet can traverse. To prevent NetBIOS broadcast packets from traversing the network indefinitely, set the parameter to a minimal value.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.1.13

Parameter:	**Rebroadcast Record Route**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Global
Default:	Disable
Options:	Enable │ Disable
Function:	Enables and disables the Insertion of Record Route option in rebroadcast packets.
Instructions:	If all IP entities support this option, select Enable to allow the NetBIOS entity in the router to determine whether it has received this packet before on this interface. If so, the router drops it. This option prevents rebroadcast packets from looping forever.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.1.14

NetBIOS/IP Interface Table Parameters

Use the following guidelines to configure the parameters in the NetBIOS/IP Interface Table Parameters window.

Parameter:	**Enable/Disable**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Interface
Default:	Enable
Options:	Enable │ Disable
Function:	Enables or disables NetBIOS on this IP interface.
Instructions:	If NetBIOS has been configured and enabled on the router, use this parameter to disable and reenable it on this interface as required.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.2.1.2

Parameter: **NetBIOS Name Caching**

Path: Configuration Manager > Protocols > IP > NetBIOS > Interface

Default: Enable

Options: Enable | Disable

Function: Enables or disables the ability of this interface to cache the name for each NetBIOS server active in the network.

Instructions: Select Enable if you disabled server name caching previously and you want now to reenable that function. Select Disable if you want to release system memory and processing resources otherwise dedicated to server name caching.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.2.1.8

Parameter: **Enable NetBIOS Inbound Broadcasts**

Path: Configuration Manager > Protocols > IP > NetBIOS > Interface

Default: Enable

Options: Enable | Disable

Function: Enables or disables inbound broadcasts on this interface.

Instructions: If NetBIOS is configured and enabled on the router and enabled on this interface, use this parameter to enable and disable inbound broadcasts as required.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.2.1.9

Parameter: **Enable NetBIOS Outbound Broadcasts**

Path: Configuration Manager > Protocols > IP > NetBIOS > Interface

Default: Enable

Options: Enable | Disable

Function: Enables or disables outbound broadcasts on this interface.

Instructions: If NetBIOS is configured and enabled on the router and enabled on this interface, use this parameter to enable and disable outbound broadcasts as required.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.2.1.10

Parameter:	**Rebroadcast Address**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Interface
Default:	Null
Options:	An IP broadcast address
Function:	Specifies a broadcast address to use when rebroadcasting NetBIOS packets out this interface.
Instructions:	By default, NetBIOS uses the IP broadcast address configured for this interface. Set this parameter if you want to override this broadcast address.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.2.1.11

NetBIOS/IP Static Entry Table Parameters

Use the following guidelines to configure the parameters in the NetBIOS/IP Static Entry Table window.

Parameter:	**Enable**
Path:	Configuration Manager > Protocols > IP > NetBIOS > Static Name
Default:	Enable
Options:	Enable | Disable
Function:	Enables or disables caching of the NetBIOS name you have selected.
Instructions:	Set the parameter to Enable to activate caching of the name you selected. Set the parameter to Disable to deactivate caching of the name you selected.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.11.4.1.2

Parameter: **NetBIOS Station Name**

Path: Configuration Manager > Protocols > IP > NetBIOS > Static Name > **Add**

Default: None

Options: A name string of up to 16 characters

Function: Specifies the name of a NetBIOS station.

Instructions: Enter the NetBIOS name you want to add. The name must not exceed 16 characters. The system pads names shorter than 16 characters with ASCII space characters. To enter non-ASCII values in the name, use the form *xbb*, where *bb* can be any two hexadecimal digits.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.4.1.4

Parameter: **NetBIOS Scope ID**

Path: Configuration Manager > Protocols > IP > NetBIOS > Static Name

Default: None

Options: A NetBIOS scope identifier

Function: Identifies the area of the network across which the NetBIOS name is known.

Instructions: Enter a name string that meets the requirements of the Domain Name System as described in RFC 833.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.4.1.5

Parameter: **IP Address**

Path: Configuration Manager > Protocols > IP > NetBIOS > Static Name > **Add**

Default: None

Options: The IP address of the NetBIOS station

Function: Specifies an IP address to associate with the statically configured name.

Instructions: Enter the valid IP address of a NetBIOS station.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.11.4.1.6

DNS Global Parameters

The Edit DNS Global Parameters window contains the global DNS parameters for the DNS client on the router. The parameter descriptions follow.

Parameter: Enable

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global
Default: Enable
Options: Enable | Disable
Function: Enables or disables DNS on the router.
Instructions: Accept the default, Enable, to enable DNS client services on this router. To temporarily disable DNS, set this parameter to Disable.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.2

Parameter: Time Out

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global
Default: 5
Options: 1 to 60 seconds
Function: Specifies, in seconds, the amount of time that the router waits before it retransmits a request to the DNS server.
Instructions: If you have a large network, set this value higher than the default, so that the router will not time out before it receives a response from the DNS server. Otherwise, accept the default.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.3

Parameter: Max Retransmission

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global
Default: 3
Options: 0 to 15
Function: Specifies the maximum number of times that the router can retransmit a request to the DNS server before it records an error.
Instructions: Accept the default, or enter a value from 0 to 15. Entering a high value may delay router response time when errors occur.
MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.4

Parameter: Max Outstanding Query

Path:	Configuration Manager > Protocols > Global Protocols > DNS > Global
Default:	20
Options:	1 to 100
Function:	Specifies the maximum number of outstanding queries to the server that the router allows.
Instructions:	Accept the default, or enter a value from 1 to 100. If you select a high value, be sure that the router has enough memory to accommodate the number of outstanding queries that you specify.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.19.1.5

Parameter: IP Type of Service

Path:	Configuration Manager > Protocols > Global Protocols > DNS > Global
Default:	Low Delay
Options:	Normal | Low Delay
Function:	Specifies the type of service set in the IP datagram. The type of service specifies to the transport layer (UDP) how the router handles DNS packets.
Instructions:	Nortel Networks recommends Low Delay for DNS packet transfers, because a Low Delay setting specifies a high priority for the packets.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.19.1.6

Parameter: Domain Name

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global

Default: None

Options: Any combination of up to 255 alphanumeric characters that specifies a network domain, for example, nortelnetworks.com.

Function: Specifies the default domain name that the router uses when trying to reach a DNS server. You can use this domain name when issuing a **ping** command to verify the connection to a DNS server. This parameter is valid only for use with the Technician Interface.

For example, if you want to check the connection from router A to remote Nortel Networks router B, you can set this parameter to nortelnetworks.com. When you enter the command **ping router**, router A, the DNS client, adds nortelnetworks.com to the command, making the actual command **ping router.nortelnetworks.com**. The DNS server translates the name to an IP address.

Instructions: Enter the default domain name.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.7

Parameter: Recursion

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global

Default: Enable

Options: Enable | Disable

Function: Sets the recursion bit in the DNS packet header so that if the first server that the router contacts does not have the required information, that server finds another server that can respond to the request.

Instructions: Nortel Networks recommends that you accept the default, Enable, to implement recursion for resolving requests to a DNS server.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.8

Parameter: **Ignore Truncation Error**

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global

Default: Enable

Options: Enable | Disable

Function: Specifies whether the router should reject DNS server responses that contain the truncation bit in the DNS header. Typically the information that the router uses is in the first few bytes of the response messages, so it can ignore the rest of the message.

Instructions: Accept the default, Enable, to ignore the error messages. To accept truncation error messages, set this parameter to Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.9

Parameter: **Use Auth Answer Only**

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global

Default: Disable

Options: Enable | Disable

Function: Specifies whether the router should accept data only from the authorized server.

Instructions: Select Enable to accept data only from an authorized server. Select Disable to accept data from any server.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.10

Parameter: **Use Default Domain Name**

Path: Configuration Manager > Protocols > Global Protocols > DNS > Global

Default: Enable

Options: Enable | Disable

Function: If you entered a value for the Domain Name parameter, this parameter instructs the router to use that name when sending requests to a DNS server.

Instructions: Accept the default, Enable, to use the default domain name. Otherwise, select Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.1.11

DNS Server Record Parameters

The DNS Server Record window contains the parameters that specify the approved DNS servers for the router's DNS client. The parameter descriptions follow.

Parameter: Index

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Servers > **Add**

Default: None

Options: 1 to 3

Function: Specifies the order in which the router contacts the DNS server. For example, the router first contacts a server with an index of 1. If that server is not operating, the router then contacts a server with an index of 2.

Instructions: Determine the order in which you want the router to contact a particular server and assign the appropriate index value to that server.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.2.1.2

Parameter: IP Address

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Servers > **Add**

Default: 0.0.0.0

Options: Any valid IP address

Function: Specifies the IP address of the DNS server that responds to DNS client requests.

Instructions: Enter a 32-bit IP address.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.2.1.3

Parameter: **Port Number**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Servers > **Add**

Default: 53

Options: 1 to 46000

Function: Specifies the UDP port on the DNS server to which the router should connect.

Instructions: In most cases, accept the default. Only in special situations should you specify another UDP port number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.2.1.4

DNS Proxy Server Parameters

As with the DNS global parameters, you first define a record for a DNS proxy server to add it to the DNS proxy server list. Then you can edit the contents of that record using the DNS Proxy List window.

DNS Proxy Server Record Parameters

The DNS Proxy Record window appears when you add a new DNS proxy server from the DNS Proxy List window. The parameter descriptions for the DNS Proxy Record window follow.

Parameter: **IP Address**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 0.0.0.0

Options: Any valid IP address

Function: Specifies the IP address of the local IP interface.

Instructions: If you have already configured IP on the interface, that IP address appears as the default. Either accept that address or supply a different address to use for the local IP interface.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.4

Parameter: Proxy Mode

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: Passthru

Options: Passthru

Function: Specifies that the DNS proxy server is operating in standard pass-through mode.

Instructions: Accept the default value, Passthru.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.6

Parameter: Proxy Listen Port Number

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 53

Options: 1 to 46000

Function: Specifies the UDP port to which the DNS proxy server listens on the interface on which it is configured.

Instructions: In most cases, accept the default. Only in special situations should you specify another UDP port number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.5

Parameter: DNS Server 1

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: None

Options: Any valid IP address

Function: Specifies the first DNS server to forward requests to this domain.

Instructions: Specify the address of the first DNS server for this domain in the DNS proxy server list.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.8

Parameter: DNS Server 2

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: None

Options: Any valid IP address

Function: Specifies the second DNS server to forward requests to this domain.

Instructions: Specify the address of the second DNS server for this domain in the DNS proxy server list.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.9

Parameter: DNS Server 3

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: None

Options: Any valid IP address

Function: Specifies the third DNS server to forward requests to this domain.

Instructions: Specify the address of the third DNS server for this domain in the DNS proxy server list.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.10

Parameter: DNS Server Port Number

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 53

Options: 1 to 46000

Function: Specifies the UDP port to which the DNS servers are connected.

Instructions: In most cases, accept the default. Only in special situations should you specify another UDP port number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.11

Parameter: Timeout (in seconds)

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 5

Options: 1 to 60

Function: Specifies, in seconds, the amount of time that the DNS proxy waits before it retransmits a request to the DNS server.

Instructions: If you have a large network, set this value higher than the default so that the router will not time out before it receives a response from the DNS server. Otherwise, accept the default.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.12

Parameter: Max. Retransmissions

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 2

Options: 0 to 15

Function: Specifies the maximum number of times that the DNS proxy can retransmit a request to the DNS server before recording an error.

Instructions: Accept the default, or enter a value from 0 to 15. Entering a high value may delay router response time when errors occur.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.13

Parameter: **Max. Outstanding Req.**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 20

Options: 1 to 100

Function: Specifies the maximum number of outstanding queries to the server that the DNS proxy allows.

Instructions: Accept the default, or enter a value from 1 to 100. If you select a high value, be sure that the router has enough memory to accommodate the number of outstanding queries that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.14

Parameter: **Answer Truncation**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: Disable

Options: Enable | Disable

Function: Specifies whether the DNS proxy can truncate the number of DNS answers.

Instructions: Accept the default, Disable, to prohibit the DNS proxy from truncating the number of DNS answers. To allow truncation, set this parameter to Enable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.15

Parameter: **Trunc. Max. Allowed**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 1

Options: 1 to 100

Function: If the Answer Truncation parameter is enabled, the Trunc. Max. Allowed parameter specifies the maximum number of answers returned to the requester.

Instructions: Specify the maximum number of answers to be returned to the requester.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.16

Parameter: **Cache Size**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy > **Add**

Default: 20

Options: 1 to 100

Function: Specifies the maximum number of cache entries that the DNS proxy allows to be stored on the router.

Instructions: Accept the default, or enter a value from 1 to 100. If you select a high value, be sure that the router has enough memory to accommodate the number of cached entries that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.17

DNS Proxy Server Parameters

The DNS Proxy Server List window contains the DNS parameters for the DNS proxy on the network interface. The parameter descriptions follow.

Parameter: **Enable/Disable**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: Enable

Options: Enable | Disable

Function: Enables or disables a DNS proxy on the interface.

Instructions: Accept the default, Enable, to enable DNS proxy services on this interface. To disable the DNS proxy, set this parameter to Disable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.2

Parameter: **Proxy Mode**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: Passthru

Options: Passthru

Function: Specifies that the DNS proxy server is operating in standard pass-through mode.

Instructions: Accept the default value, Passthru.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.6

Parameter: Proxy Listen Port Number

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: 53

Options: 1 to 46000

Function: Specifies the UDP port to which the DNS proxy server listens on the interface on which it is configured.

Instructions: In most cases, accept the default. Only in special situations should you specify another UDP port number.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.5

Parameter: DNS Server 1

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: None

Options: Any valid IP address

Function: Specifies the first DNS server to forward requests to this domain.

Instructions: Specify the address of the first DNS server for this domain in the DNS proxy server list.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.8

Parameter: DNS Server 2

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: None

Options: Any valid IP address

Function: Specifies the second DNS server to forward requests to this domain.

Instructions: Specify the address of the second DNS server for this domain in the DNS proxy server list.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.9

Parameter: DNS Server 3

Path:	Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy
Default:	None
Options:	Any valid IP address
Function:	Specifies the third DNS server to forward requests to this domain.
Instructions:	Specify the address of the third DNS server for this domain in the DNS proxy server list.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.19.3.1.10

Parameter: DNS Server Port Number

Path:	Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy
Default:	53
Options:	1 to 46000
Function:	Specifies the UDP port to which the DNS servers are connected.
Instructions:	In most cases, accept the default. Only in special situations should you specify another UDP port number.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.19.3.1.11

Parameter: Timeout (in secs)

Path:	Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy
Default:	5
Options:	1 to 60
Function:	Specifies, in seconds, the amount of time that the DNS proxy waits before it retransmits a request to the DNS server.
Instructions:	If you have a large network, set this value higher than the default so that the router will not time out before it receives a response from the DNS server. Otherwise, accept the default.
MIB Object ID:	1.3.6.1.4.1.18.3.5.3.19.3.1.12

Parameter: Max. Retransmissions

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: 2

Options: 0 to 15

Function: Specifies the maximum number of times that the DNS proxy can retransmit a request to the DNS server before it records an error.

Instructions: Accept the default, or enter a value from 0 to 15. Entering a high value may delay router response time when errors occur.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.13

Parameter: Max. Outstanding Req.

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: 20

Options: 1 to 100

Function: Specifies the maximum number of outstanding queries to the server that the DNS proxy allows.

Instructions: Accept the default, or enter a value from 1 to 100. If you select a high value, be sure that the router has enough memory to accommodate the number of outstanding queries that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.14

Parameter: Answer Truncation

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: Disable

Options: Enable | Disable

Function: Specifies whether the DNS proxy can truncate the number of DNS answers.

Instructions: Accept the default, Disable, to prohibit the DNS proxy from truncating the number of DNS answers. To allow truncation, set this parameter to Enable.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.15

Parameter: **Trunc. Max. Allowed**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: 1

Options: 1 to 100

Function: If the Answer Truncation parameter is enabled, the Trunc. Max. Allowed parameter specifies the maximum number of answers returned to the requester.

Instructions: Specify the maximum number of answers to be returned to the requester.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.16

Parameter: **Cache Size**

Path: Configuration Manager > Protocols > Global Protocols > DNS > DNS Proxy

Default: 20

Options: 1 to 100

Function: Specifies the maximum number of cache entries that the DNS proxy allows to be stored on the router.

Instructions: Accept the default, or enter a value from 1 to 100. If you select a high value, be sure that the router has enough memory to accommodate the number of cached entries that you specify.

MIB Object ID: 1.3.6.1.4.1.18.3.5.3.19.3.1.17

IP Accounting Parameters

Use the following guidelines to configure the IP accounting parameters in the Edit IP Global Parameters window.

Parameter: **Enable**

Path: Configuration Manager > Protocols > IP > Global

Default: Enable

Options: Enable | Disable

Function: Enables and disables IP accounting on the router.

Instructions: Use this parameter to disable and reenable IP accounting.

MIB Object ID: 1.3.6.1.4.1.18.3.5.20.1.1.2

Parameter: Threshold

Path: Configuration Manager > Protocols > IP > Global
Default: 512
Options: 1 to 10,240 entries
Function: Specifies the maximum number of entries in the IP accounting table.
Instructions: Specify a maximum number that meets the requirements of IP accounting on this router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.20.1.1.3

Parameter: Trap Percent

Path: Configuration Manager > Protocols > IP > Global
Default: 80
Options: 1 to 100 percent
Function: Specifies a value (a percentage of the maximum number of entries in the accounting table) that causes IP accounting to send a trap message.
Instructions: Specify a percentage that meets the requirements of IP accounting on this router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.20.1.1.5

Parameter: IP Accounting Checkpoint Flag

Path: Configuration Manager > Protocols > IP > Global
Default: 0
Options: 0 to 0x7FFFFFFF
Function: Allows you to specify when IP accounting takes a snapshot of the active table and puts it in the checkpoint table.
Instructions: Specify a flag value that meets the requirements of IP accounting on this router.
MIB Object ID: 1.3.6.1.4.1.18.3.5.20.1.1.7

Appendix B
Configuring IP Accounting on a Frame Relay Interface

IP accounting is a mechanism for counting transit data packets -- that is, packets that IP receives on one interface and forwards out another interface. This mechanism allows a network service provider to bill a network user according to the amount of data that it routes between two locations.

Nortel Networks provides IP accounting support for synchronous interfaces configured with frame relay in group access mode (the default mode). IP accounting counts all data packets that the router receives on any IP interface and forwards out an IP/frame relay interface.

IP accounting keeps track of transit data packets by making an entry for each packet in an IP accounting table. Each entry includes the following fields: the source address of the packet, the destination address of the packet, the number of packets forwarded, and the number of bytes forwarded.

Caution: If the frame relay interface becomes overrun and the driver drops packets, these packets will still be counted by IP accounting.

The following sections describe how to configure IP accounting on a frame relay interface:

Topic	Page
Enabling IP Accounting on the Router	B-2
Specifying the Maximum Size of the IP Accounting Table	B-3
Controlling Notification of a Full IP Accounting Table	B-3
Copying the IP Accounting Table to the Checkpoint Table	B-4

Enabling IP Accounting on the Router

By default, IP accounting support is disabled on the router. You can use Site Manager to enable IP accounting.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Chose **IP**.	The IP menu opens.
3. Choose **Global**.	The Edit IP Global Parameters window opens.
4. Set the **Enable** parameter. Click on **Help** or see the parameter description on page A-43.	
5. Click on **OK**.	You return to the Configuration Manager window.

Specifying the Maximum Size of the IP Accounting Table

By default, the IP accounting table can contain up to 512 entries per slot.

You can use Site Manager to specify the maximum number of entries in the IP accounting table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **Global**.	The Edit IP Global Parameters window opens.
4. Set the **Threshold** parameter. Click on **Help** or see the parameter description on page A-44.	
5. Click on **OK**.	You return to the Configuration Manager window.

Controlling Notification of a Full IP Accounting Table

By default, IP accounting sends a log message when the active IP accounting table is 80 percent full. You must configure a trap to be sent. Use Site Manager to configure a trap exception for entity 6 and event 99.

You can use Site Manager to specify a value from 1 to 100 (indicating the percentage of the maximum size) that causes IP accounting to send a trap message.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.

(continued)

Site Manager Procedure *(continued)*	
You do this	**System responds**
3. Choose **Global**.	The Edit IP Global Parameters window opens.
4. Set the **Trap Percent** parameter. Click on **Help** or see the parameter description on page A-44.	
5. Click on **OK**.	You return to the Configuration Manager window.

Copying the IP Accounting Table to the Checkpoint Table

When the IP accounting table is filled to capacity, IP accounting can make no further entries until you empty the table. You can empty the accounting table by copying its contents to a checkpoint table.

Site Manager Procedure	
You do this	**System responds**
1. In the Configuration Manager window, choose **Protocols**.	The Protocols menu opens.
2. Choose **IP**.	The IP menu opens.
3. Choose **Global**.	The Edit IP Global Parameters window opens.
4. Set the **IP Accounting Checkpoint Flag** parameter. Click on **Help** or see the parameter description on page A-44.	
5. Click on **OK**.	You return to the Configuration Manager window.

IP accounting maintains two aging counters, one for the accounting table and one for the checkpoint table. When you copy the contents, IP accounting resets both counters to 0.

Appendix C
Configuring IP Global Access Policies

Using the BCC, you can create global IP access policies that permit or deny access to specific IP services. These services are Telnet, FTP, TFTP, NTP, SNMP, and HTTP Server.

You define an access policy by setting parameters as described under the following topics:

Topic	Page
Creating and Naming the Policy	C-2
Specifying the IP Service	C-2
Specifying the Policy Action	C-3
Specifying the Precedence	C-3
Specifying the Network to Which the Policy Applies	C-4
Disabling and Reenabling a Policy	C-4
Disabling and Reenabling Logging	C-5
Global IP Access Policy Example	C-5

Creating and Naming the Policy

To create an IP global access policy, navigate to the IP global prompt (for example, **box; ip**) and enter:

access-policy polname *<policy_name>*

policy_name is a unique name for this policy.

For example, the following command sequence creates a policy named policy_1 and displays the current (default) values for the policy:

```
ip# access-policy polname policy_1
access-policy/policy_1# info
   action deny
   log on
   service telnet
   precedence 0
   polname policy_1
   state enabled
```

Specifying the IP Service

By default, the global IP access policy controls access for Telnet.

To specify the IP utility for which you want this policy to control access, navigate to the policy-specific prompt (for example, **box; ip; access-policy/policy_1**) and enter:

service *<service>*

service is:

telnet (default)
ftp
tftp
snmp
ntp
http

For example, the following command specifies FTP as the IP utility controlled by policy_1:

```
access-policy/policy_1# service ftp
access-policy/policy_1#
```

Specifying the Policy Action

By default, the policy denies access to the IP utility that you specify (see “Specifying the IP Service” on page C-2).

To specify whether the IP global access policy that you created allows or denies access to the IP utility, navigate to the policy-specific prompt (for example, **box; ip; access-policy/policy_1**) and enter:

action *<action>*

action is:

deny (default)
allow

For example, the following command allows access to the service specified for policy_1:

```
access-policy/policy_1# action allow
access-policy/policy_1#
```

Specifying the Precedence

The precedence parameter specifies the precedence of this policy relative to other global IP access policies.

To set the precedence for a global IP access policy, navigate to the policy-specific prompt (for example, **box; ip; access-policy/policy_1**) and enter:

precedence *<precedence>*

precedence is an integer.

For example, the following command sets the precedence of policy_1 to 5:

```
access-policy/policy_1# precedence 5
access-policy/policy_1#
```

Specifying the Network to Which the Policy Applies

You must specify the IP address or range of contiguous addresses to which the policy that you created applies. Navigate to the policy-specify prompt (for example, **box; ip; access-policy/policy_1**) and enter:

network *<ip_address/ip_mask>*

ip_address/ip_mask is an address/mask pair indicating the IP address or range of IP addresses to which this policy applies.

For example, the following command specifies 192.32.150.0/255.255.255.0 as the address and mask to which policy_1 applies:

```
access-policy/policy_1# network 192.32.150.0/255.255.255.0
network/policy_1/192.32.150.0/255.255.255.0#
```

Disabling and Reenabling a Policy

By default, the access policy is enabled on the router.

To change the state of the global IP access policy that you created, navigate to the policy-specific prompt (for example, **box; ip; access-policy/policy_1**) and enter:

state *<state>*

state is:

enabled (default)
disabled

For example, the following command disables policy_1:

```
access-policy/policy_1# state disabled
access-policy/policy_1#
```

Disabling and Reenabling Logging

By default, the IP global access policy turns message logging on.

To turn message logging off and on for the policy that you created, navigate to the policy-specific prompt (for example, **box; ip; access-policy/policy_1**) and enter:

log *<state>*

state is:

on (default)
off

For example, the following command turns off logging for policy_1:

```
access-policy/policy_1# log off
access-policy/policy_1#
```

Global IP Access Policy Example

The following command sequence creates a global access policy called no-telnet:

```
ip# access-policy polname no-telnet
access-policy/no-telnet# network 192.32.150.0/255.255.255.0
network/no-telnet/192.32.150.0/255.255.255.0# info
   address 192.32.150.0
   mask 255.255.255.0
   state enabled

network/no-telnet/192.32.150.0/255.255.255.0# back
access-policy/no-telnet# info
   action deny
   log on
   service telnet
   precedence 0
   polname no-telnet
   state enabled
access-policy/no-telnet#
```

Appendix D
BCC show Commands

To display configuration and statistical data about DNS, FTP, NTP, TCP, Telnet, and TFTP from the management information base (MIB), use the BCC **show** command.

This appendix includes descriptions of the following **show** commands:

Command	Page
show dns server	D-2
show dns stats	D-3
show ftp	D-3
show ntp access	D-4
show ntp base	D-5
show ntp peers	D-5
show ntp stats	D-6
show tcp connections	D-6
show tcp stats	D-7
show telnet	D-8
show tftp	D-9

Online Help for show Commands

To display a list of command options, enter one of these commands at any BCC prompt:

- **show dns ?**
- **show ftp ?**
- **show ntp ?**
- **show tcp ?**
- **show telnet ?**
- **show tftp ?**

To learn more about any **show** command option and its syntax, use the question mark (**?**) command as follows:

Example

```
bcc> show ntp ?
   access    base   peers  stats

bcc> show ntp peers ?
show ntp peers
   No further options available
bcc>
```

show dns server

The **show dns server** command displays information about the DNS servers configured for the DNS client on the router. The output includes the following information:

Server	Number of the server from 1 to 3.
Address	IP address of the DNS server.
Port	Port that the DNS server uses. The default port is 53.

show dns stats

The **show dns stats** command displays the DNS counters. The output includes the following information:

Queries sent	Number of queries sent.
Responses received	Number of responses received.
Non-authoritative responses	Number of nonauthoritative (cached data) responses.
Empty responses	Number of responses containing no data.
Unknown server responses	Number of unsolicited responses received from servers.
Unparseable responses	Number of responses received that were unparseable.
Retransmits	Number of packets retransmitted.
Time-outs	Number of queues that internally timed out.
Receive errors	Number of queries returned with an error.
Local errors	Number of local errors.

show ftp

The **show ftp** command displays configuration and statistical information about the File Transfer Protocol (FTP) service. The output includes the following information:

Default Volume	File system volume to which transferred files are written and from which they are retrieved. The volume number corresponds to the slot number on which the volume resides.
Idle Timeout	Timeout (in seconds) to close the FTP control connection if the connection remains idle. The default is 900 seconds (15 minutes).
Max Sessions	Maximum number of FTP sessions allowed at one time. The default is three sessions.
Max Login Retries	Maximum number of FTP login retries allowed after a login failure. The default is three retries.
Transfer Type	File transfer type: ASCII or Binary.

Control Type	Type of service (ToS) value set for control connection in the IP datagram that specifies to the transport layer how the datagram should be handled. The options are Normal and Low Delay (Low Delay is the default).
Data Type	Type of service (ToS) value set for data transfer in the IP datagram that specifies to the transport layer how the datagram should be handled. The options are Normal and High Throughput (High Throughput is the default).
TCP Window Size	Size in bytes of the windows used for FTP TCP connections. The default is 16,000 bytes.
Logins	Number of successful FTP logins.
Logins Failed	Number of FTP logins that failed.
Files Received	Number of files successfully received.
Average In Kb/s	Average transfer rate in kilobytes per second for receiving data.
In Errors	Number of errors logged during inbound transfer.
Files Sent	Number of files successfully sent.
Avg Out Kb/s	Average transfer rate in kilobytes per second for sending data.
Out Errors	Number of errors logged during outbound transfer.

show ntp access

The **show ntp access** command displays information about the Network Time Protocol (NTP) servers preferred (accepted) or restricted (rejected) by the local NTP client. The output includes the following information:

IP Address	IP address of this remote NTP server.
IP Mask	IP subnet mask for this remote NTP server.
Filter Type	• Restrict -- The local NTP client drops packets received from this remote NTP server. • Prefer -- The local NTP client accepts packets received from this remote NTP server.

show ntp base

The **show ntp base** command displays the base record information for the NTP client running on the router. The base record controls NTP on the router. The output includes the following information:

NTP State	Actual (dynamic) state of the local NTP client: • *Disabled* -- User has manually disabled NTP. • *Up* -- NTP is operating on the router. • *Down* -- NTP is not functioning on the router. • *Init* -- NTP is initializing on the router. • *Not Present* -- NTP has been configured but not started on the router.
Version	Current version of NTP software on the router.
Reference ID	IP address of the remote NTP peer (that is, the *system peer*) to which the local NTP client is synchronized.
Stratum	Number of NTP peers that exist between the local NTP client and the NTP stratum 1 server for this network. (The stratum number includes the local NTP client.)

show ntp peers

The **show ntp peers** command displays configuration and status information about NTP servers known to the NTP client on the router. The output includes the following information:

IP Address	IP address of this remote NTP peer.
Peer Mode	Mode in which this remote NTP peer operates on the network: Server. (Because NTP operates locally in client mode only, all remote peers known to the router are servers.)
State	State of the remote NTP server: • 1 = Up • 2 = Down
Ref. ID	IP address of the system peer to which this remote NTP peer is synchronized.
Preferred	• Preferred -- Local NTP client prefers (accepts) packets from this remote NTP server. • Not Preferred -- Local NTP client does not prefer (rejects) packets from this remote NTP server.

show ntp stats

The **show ntp stats** command displays information about the number of:

- Polls (requests for information) sent by the local NTP client to the designated remote NTP server
- Packets received by the local NTP client from the designated remote NTP server

The output includes the following information:

IP Address	IP address of this remote NTP server.
Polls Sent	Number of polls (requests for information) sent from the local NTP client to this NTP server.
Packets Received	Number of NTP packets received (and accepted) from this remote NTP server.

show tcp connections

The **show tcp connections** command displays information about each Transmission Control Protocol (TCP) connection. The table includes the IP address, port numbers, and state associated with each connection.

The output includes the following information:

Local IP Address	Local IP address for this TCP connection. In the case of a connection in the listen state that will accept connections for any IP interface associated with the node, the value 0.0.0.0 is used.
Local Port	Local port number for this TCP connection.
Remote IP Address	Remote IP address for this TCP connection.
Remote Port	Remote port number for this TCP connection.
State	Current state of TCP. Possible values are: up (1), down (2), init (3), and not present (4).
Md5 Errors	Number of TCP packets dropped due to MD5 authentication errors.

show tcp stats

The **show tcp stats** command displays information about the TCP configuration. The output includes the following information:

State	Current state of TCP. Possible values are: up (1), down (2), init (3), and not present (4).
Timeout Minimum	Minimum value in milliseconds permitted for the retransmission timeout. When one side of a TCP connection sends a frame and the other side of the connection does not acknowledge the transmission within the timeout period, the sending station retransmits the frame.
Timeout Maximum	Maximum value in milliseconds permitted for the retransmission timeout. When one side of a TCP connection sends a frame and the other side of the connection does not acknowledge the transmission within the timeout period, the sending station retransmits the frame.
Maximum Window Size	Maximum transmit and receive window size that TCP allows for each connection.
Timeout Algorithm	Algorithm for determining when to retransmit unacknowledged packets. Nortel Networks implements the Van Jacobson algorithm only.
Active Opens	Number of times that TCP connections have made a direct transition to the SYN-SENT state from the CLOSED state.
Passive Opens	Number of times that TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
Number of Segments Received	Total number of segments received, including those received in error. This count includes segments received on currently established connections.
Number of Segments Sent	Total number of segments sent, including those on the current connections, but excluding those containing only retransmitted octets.
Number of Segments Retransmitted	Total number of segments retransmitted -- that is, the number of TCP segments transmitted containing one or more previously transmitted octets.

Bad Segments Received	Total number of segments received in error.
Segments Sent Containing the Reset Flag	Number of TCP segments sent containing the reset flag.

show telnet

The **show telnet** command displays information about Telnet services. The output includes the following information:

Telnet Server Statistics	
State	Current state of the Telnet server: enabled or disabled.
Prompt	Character string used as the system prompt on the Telnet BCC console.
Lines/Screen	Number of lines that can be displayed in one screen on the Telnet BCC console.
Max. Login Retries	Number of retries allowed after a failed login before the system disconnects.
Login Timeout (min.)	Number of minutes allowed between when the system displays the login banner and a user enters a login ID.
Passwd. Timeout (min.)	Number of minutes allowed to enter a password. If this timeout period expires, the system disconnects.
Command Timeout (min.)	Command line timeout value. If you do not enter a command in this number of minutes, the system disconnects.
Telnet Client Statistics	
State	Current state of the Telnet client: enabled or disabled.
Prompt	Character string used as the system prompt on the Telnet BCC console.
Remote Port	Remote port number for this Telnet connection.
Telnet In-Bound Sessions	
Remote Address	IP address of the remote peer.
Remote Port	Remote port number for this Telnet connection.
Local Address	IP address of the local peer.
Local Port	Local port number for this Telnet connection.

show tftp

The **show tftp** command displays information about the Trivial File Transfer Protocol (TFTP) status. The output includes the following information:

TFTP Protocol	Current state of the TFTP protocol: enabled or disabled.
Default Volume	File system volume number to which transferred files will be written and from which they will be retrieved. The volume number corresponds to the slot number on which the volume resides.
Retransmit Timeout Value (sec.)	General retransmission timeout value in seconds.
Maximum Number of Retransmits	Maximum number of retransmissions.
Number of Writes Received	Number of write requests received.
Number of Reads Received	Number of read requests received.
Number of Retransmits	Number of retransmitted data packets.

Index

Numbers

15-Character NetBIOS Name Caching parameter, 8-5, A-22

A

acronyms, xix
Answer Truncation parameter (DNS proxy), A-38, A-42

C

Cache Size parameter (DNS proxy), A-39, A-43
clients, TCP, 2-4
Close Time Out parameter, A-9
Command Timeout parameter, A-12
conventions, text, xviii
Create MIB Inst for Cached Name parameter, 8-6, A-22
customer support, xxi

D

Default Volume parameter, A-8
deleting, TFTP from the router, 5-7
disabling
  inbound and outbound broadcasts for NetBIOS over IP, 8-11
  name caching for NetBIOS over IP, 8-10
  NetBIOS over IP, 8-2, 8-10
  static name caching for NetBIOS over IP, 8-14
DNS (Domain Name System)
  customizing, 9-1, 10-1
  deleting, 9-10, 9-11
  overview, 2-24
  show server command, D-2
  show stats command, D-3
  starting client services, 1-12
  starting proxy server, 1-15
DNS client
  contacting alternate servers, 9-5
  handling server responses, 9-6
  making server requests, 9-3, 10-1
DNS proxy server, creating, 1-15
DNS server
  client requests, customizing, 9-3, 10-1
  creating list for client, 9-7
  deleting server entries, 9-10
  ensuring responses, 9-5
DNS Server 1 parameter (DNS proxy), A-35, A-40
DNS Server 2 parameter (DNS proxy), A-36, A-40
DNS Server 3 parameter (DNS proxy), A-36, A-41
DNS Server Port Number parameter (DNS proxy), A-36, A-41
Domain Name parameter (DNS), A-31
Domain Name System. *See* DNS

E

Enable NetBIOS Inbound Broadcasts parameter, 8-12, A-26
Enable NetBIOS Outbound Broadcasts parameter, 8-12, A-26
Enable parameter
  DNS, A-29
  IP accounting, B-2
  NetBIOS static entry, 8-14, A-27
  TFTP, A-8

Enable/Disable parameter
DNS proxy, A-39
FTP, A-5
NetBIOS global, A-21
NetBIOS interface, A-25
NTP, A-17
TCP, A-3
Telnet client, A-16
Telnet server, A-9
enabling
inbound and outbound broadcasts for NetBIOS over IP, 8-11
IP accounting, B-2
name caching for NetBIOS over IP, 8-10
NetBIOS Insertion of Record Route option, 8-3
NetBIOS name caching, 8-4
NetBIOS over IP, 8-2, 8-10
static name caching for NetBIOS over IP, 8-14

F

FTP (File Transfer Protocol)
customizing, 4-1
global parameters, A-5
maximum number of sessions, 4-7
overview, 2-7
show command, D-3
starting, 1-5
TCP window size, 4-10

H

Hash Entry Count parameter, 8-9, A-24

I

Idle Time Out parameter (FTP), A-6
Ignore Truncation Error parameter (DNS), A-32
Index parameter (DNS), A-33
Internet Protocol (IP), 2-1
IP accounting
configuring, B-1
copying table to checkpoint table, B-4
enabling, B-2
maximum table size for, B-3
notification of full table, B-3
IP Address parameter
DNS, A-33
IP configuration, 1-4
NetBIOS static entry, A-28
IP Type of Service parameter (DNS), A-30
IP, starting, 1-3

M

Max Name Cache Entries parameter (NetBIOS), 8-7, A-23
Max Outstanding Query parameter (DNS), A-30
Max Retransmission parameter (DNS), A-29
Max. Outstanding Req. parameter (DNS proxy), A-38, A-42
Max. Retransmission Timeout parameter (TCP), A-4
Max. Retransmissions parameter (DNS proxy), A-37, A-42
Max. Window Size parameter (TCP), 2-5, A-4
memory
and number of Telnet connections, 2-12
considerations for configuring TCP, 2-5
Min. Retransmission Timeout parameter (TCP), A-3

N

Name Cache Age parameter, 8-8, A-23
NetBIOS Name Caching parameter
global, 8-5, A-22
interface, 8-11, A-26
NetBIOS over IP
adding a traffic filter, 8-14
aging a cache entry, 8-7
configuring a cache, 8-4
configuring a static name, 8-13
creating MIB instance for cached name, 8-6
customizing a cache search, 8-8
enabling and disabling, 8-2, 8-10
inbound and outbound broadcasts, 8-11
name caching, 8-4, 8-10
static name caching, 8-14
Insertion of Record Route option, 8-3
overview, 2-20
rebroadcast address for, 8-12

NetBIOS over IP *(continued)*
size of name cache for, 8-7
starting on the router, 1-11
TTL value for a rebroadcast packet, 8-2
NetBIOS Scope ID parameter, A-28
NetBIOS Station Name parameter, A-28
NetBIOS/IP parameters
global, A-21
interface, A-25
static entry table, A-27
Network Basic Input/Output System (NetBIOS) over IP. *See* NetBIOS over IP
Network Time Protocol. *See* NTP
NTP
customizing, 7-1
overview, 2-15
parameters, A-17
show access command, D-4, D-5, D-6
show base command, D-5
show peers command, D-5
show stats command, D-6
starting, 1-10

P

parameters. *See* parameter names
Port Number parameter (DNS), A-34
ports, TCP, 2-4
product support, xxi
Proxy Listen Port Number parameter (DNS proxy), A-35, A-40
Proxy Mode parameter (DNS proxy), A-35, A-39
publications, hard copy, xxi

R

Rebroadcast Address parameter, 8-12, A-27
Rebroadcast Packet TTL parameter, 8-3, A-24
Rebroadcast Record Route parameter, 8-3, A-25
Recursion parameter (DNS), A-31
Retransmit parameter, A-9
Retry Time Out parameter, A-8

S

show dns commands
server, D-2
stats, D-3
show ftp command, D-3
show ntp commands
access, D-4, D-5, D-6
base, D-5
peers, D-5
stats, D-6
show tcp commands
connections, D-6
stats, D-7
show telnet command, D-8
show tftp command, D-9
Simple Network Management Protocol (SNMP), 2-11
sockets, TCP, 2-4
starting IP, 1-3
Subnet Mask parameter, IP configuration, 1-4
support, Nortel Networks, xxi

T

TCP
clients, 2-4, 2-6
connection states, 2-4 to 2-7
customizing, 3-1
memory considerations, 2-5
overview, 2-3
ports, 2-4
show connections command, D-6
show stats command, D-7
starting, 1-4
TCP Global parameters
Enable/Disable, A-3
Max. Retransmission Timeout, A-4
Max. Window Size, 2-5, A-4
Min. Retransmission Timeout, A-3
TCP Window Size parameter (FTP), A-7
technical publications, xxi
technical support, xxi
Technician Interface, 2-11

Telnet
customizing, 6-1
overview, 2-11
show command, D-8
starting, 1-8
Telnet Client Global parameters
descriptions of, A-16
Enable/Disable, A-16
Remote Port, A-17
Verbose Debug Logging, A-16
Telnet Server Global parameters
Command Timeout, A-12
Diagnostic Network Data, A-13
Diagnostic Options, A-14
Diagnostic Report, A-12, A-13
Force User Logout, A-15
Login Retries, A-12
Login Timeout, A-11
Manager's Login Script, A-9
TI More, A-10, A-11
User's Login Script, A-14, A-15
text conventions, xviii
TFTP
customizing, 5-1
deleting, 5-7
overview, 2-10
show command, D-9
starting, 1-6
Threshold parameter (IP accounting), B-3
Time Out parameter (DNS), A-29
Timeout parameter (DNS proxy), A-37, A-41
Transmission Control Protocol. *See* TCP
Transmit Bcast Addr parameter, IP configuration, 1-4
Trap Percent parameter (IP accounting), B-4
Trivial File Transfer Protocol. *See* TFTP
Trunc. Max. Allowed parameter (DNS proxy), A-38, A-43

U

UnNumbered Assoc Address parameter, IP configuration, 1-4
Use Auth Answer Only parameter (DNS), A-32
Use Default Domain Name parameter (DNS), A-32

W

window size for TCP, 2-5, 4-10